







# **ANCIENT HINDU MEDICINE**



**AN INTERPRETATION  
OF  
ANCIENT HINDU MEDICINE**

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**BY  
CHANDRA CHAKRABERTY**

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**TO  
SRIJUKTA LAKSHMIKANTA CHAKRABERTY  
THIS BOOK IS AFFECTIONATELY DEDICATED**



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## Foreword

I started this Book with the idea of making it a comparative study of the ancient Hindu and Greek systems of Medicine in the light of modern knowledge. But I soon realized that the Hindu students for whom this book is chiefly intended, would not be interested in the Greek Medicine, and as there are excellent translations of the works of Hippocrates,\* I have confined myself to the interpretation of the Ancient Hindu Medicine alone.

I was forced to the conclusion that the Ancient Greek Schools of Medicine were indebted to the Hindu Systems for the following reasons :—(1) *Indigenous Indian drugs* are found in the works of *Hippocrates* as (a) *Kardamomon* from Sk. 'kardama' ( cardamon ) as an emmenagogue in

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\* I. E. Littré : *Oeuvres Complete D' Hippocrate* ( Text and translation ) 10 Vols. J. B. Bailier et Fils, Paris, 1839-1861. I have used this edition for my reference.

2. Robert Fuchs : *Hippokrates Sammtliche Werke*, 3 Vols. München, 1895-1900.

3. F. Adams : *Genuine Works of Hippocrates* ( partial ), Sydenham Society.

Vol. VII. p. 358 ; in dyspnea in Vol. VIII. p. 80 ; (b) *Amomon* from Sk. 'elā' (*Elettaria cardamomum*) as an emmenagogue in Vol. VII. p. 358 ; (c) *Peperi* from Sk. 'pippali' (*Piper longum*) as an expectorant, mixed with honey-water in Vol. II. p. 464 ; in nasal catarrh in Vol. V. p. 183 ; in gingivitis in Vol. V. p. 244 ; as an errhine in Vol. V. p. 328 ; as a drink with honey, vinegar and water in Vol. VII. p. 150 ; with wine and oil in a pessary in Vol. VII. p. 364 ; in quartan fever in Vol. VIII. p. 654 ; *Dia-trion piperidon*, from Sk. 'trikātu,' a preparation made from three species of '*Piper*' (*nigrum*, *longum* and *album*) ; (d) *Kinnamomos* from Sk. 'tvak' (*Cinnamomum zeylonacum*) with myrrha, and safran in fumigation in Vol. VII. p. 372 ; simple fumigation in Vol. VIII. p. 364 ; (e) *Akoros* from Sk. 'vacha' (*Acorus colamus*) with myrrha as antiseptic injection in Vol. VII. p. 368 ; made infusion with dry pomegranate skin in wine for astringent injection in Vol. VIII. p. 860 ; (f) *Nardon* from Sk. 'jatāmāṇsi' (*Nardostachys valeriana*) as antiseptic fumigation with cinnamon, myrrha and rose perfume in Vol. VII. p. 372 ; as an astringent antiseptic wash in lochia in Vol. VII. p. 04 ; (g) *Sesamon* from Sk. 'tila' (*Sesamum indicum*) as a vulnerary in

empyema—suppurative abscess in Vol. II. p. 518 ; in the treatment of adiposis in Vol. VI. p. 76 ; as a plaster in long-standing catarrh in Vol. V. p. 432 ; as a fattening food in Vol. VI, p. 258. ; as a nutritive food in Vol. VI. p. 544 ; as a substitute for cheese in Vol. VII. p. 78 ; in coughing of the children in Vol. VIII. 82 ; (h) *Ziggiberis* from Sk. 'śringavera' ( Zingiber officinale ) ; *Kostos* from Sk. 'kuṣṭha' ( Costus speciosus ) ; *Sakcharon* from Sk. 'sarkarā' ( Saccharum officinarum ) ; *Pepéreos riza* from Sk. 'pippali-mūla' ( radix Piper longum ) ; *Kupeiros* from Sk. 'mustaka' (Cyperus rotundus); *Bdellion* from Sk. 'guggula' ( Aquilaria agallocha ) ; etc.

(2) *Humoral Pathology* : In 'Peri Physios Anthropoy' ( On the Nature of Man ) Vol. VI. p. 32-69, Hippocrates advances arguments of superiority of the principles of the four humors whose equilibrium in the body preserves the normal health and whose derangements are the etiological factors of disease, as the 'cima' (blood : Sk. 'rudhira'), 'phlegma' ( phlegm : Sk. 'ślesmā'), 'cholen xanthen' ( yellow bile : Sk. 'pitta' ), and 'cholen melanam' ( black bile : as a substitute for Sk. 'vāyu' ), which he for the first time introduced into Greece over the ancient doctrine

of 'hot' ( from fire ) 'cold' ( from earth ), 'dry' ( from air ) and 'moist' ( from water ) qualities which were supposed to be the basic factors of health and disease, and which he also argues in his book '*Peri Archaias Ietriches*' ( Ancient Medicine ), Vol. I. pp. 570-637. In his '*Peri Gones*' ( Generation, 3 ), Vol. VII. p. 474, 'aima; chole; udor, phlegma' are mentioned as the four humors, using 'bile' without any qualification, and in the place of one, 'udor' ( Sk. *udaka*=serous fluid ) is substituted, thus proving that the humoral question was still in transitional flux, and was not settled or fixed. In '*Peri Chymon*' ( Humors, 8, 14 ), Vol. V. p. 488, 496, seasonal changes are mentioned to cause the increase and the decrease of the humors, as the increase af the bile in the summer, and thus organisms are predisposed to certain diseases in particular seasons in which their controlling humors are predominant, in a very strikingly similar language as described in *Susruta* ( I. 6 ) on '*rtu-charyyā*'. In '*Peri Physios Anthropoy*' ( The Nature of Man, 7 ), Vol. VI. p. 46, it is argued that 'phlegma' is dominant in the winter, for the reason that man conforms to the laws of nature, and as ev^rything is cold in the winter, and as phlegma is

the coldest of all the humors in tactile sensation, it naturally therefore is in excess over other humors ; in the spring, the blood is dominant, as the phlegma is still strong, owing to the plenty of rain and sap in the soil and plant, but it becomes desiccated by the warm sun ; in the summer, the blood is still strong, but the bile is formed by the strong sun. and the phlegma is in the minimum owing to the hot, desiccant sun ; in the autumn the blood is in the minimum, but the black bile is formed in abundance, as the season is dry and the nature tends to cool itself. In '*Peri Noyson to Tetartion*' (The fourth Book of Maladies, 33), Vol. VII. p. 542, it is described how the humors are in excess or in deficiency : "I shall describe now, how the bile, the blood, the '*udrops*' (serous fluid) and the phlegma are in excess or in deficiency ; it is through the food and the drink, in this way : the full stomach is the source of all things ; but when empty, it profits at the cost of the body which it disintegrates. Moreover, there are other four sources from which each of the humors can come to the organs ; they come to the stomach, and when the stomach is empty, they go to the organs (superficial), but they come back, when

the stomach has something (ingesta). The source for the blood, is the heart, for the phlegma—the brain, for the '*udrops*' (serous fluid)—the spleen, and for the bile, the part that is in the liver (bile-duct)." And in the same book (34—38), it is mentioned that as the plant can select its food from the soil it needs, so each humor can get its nourishment from all kinds of food ; but phlegma is particularly increased by the ingestion of cheese, acrid substance, or phlegmatic food or drink ; the bile is increased by bitter food and drink, or bilious substance ; '*udrops*' (serous fluid) is increased by the water one drinks, and is pumped by the spleen to itself and other parts of the body ; the blood is increased by the bloody food one takes, and which is attracted to all parts of the body, and especially by the heart. As the disease is caused by the excessive increment of one humor over the rest, its cure lies in bringing out the coction (*pāchana*) of the said humor, and cause its evacuation and expulsion from the body ; the crisis of a disease is the turning point when the coction of the deranged humor begins, and the coction produces the periods in fever ( Vol. I. p. 617 ; Vol. II. p. 635 ; Vol. IV. p. 469 ; Vol. V. p. 485 ; Vol. VIII. p. 651 ).

(3) *India is directly mentioned in association.*

*with some of the drugs :* (a) “*Echochchous echlepsanta oson treis indichoy pharmachoy tou ton opithalmon, o chalectai peperi,chai tou stroggyloy, tria tauta leia tribein,chai oino palaio chliero dieis, balanion peri pteron ornithos tithenai,chai ode prosagein.*” (Another : three decorticated grains, *Indian drug* which is for the eys and is called ‘pepper’, the round grain—these three are to be pounded and moistened with warmed old wine, it is to be pasted round a plum, and to be introduced thus ( as a pessary ). *Gynaikeion Proton*: ( Female Diseases, 81 ; Vol. VIII. p. 202 ). (b) “*E echlepsas chochchous peuntechaidecha, esto de chai indichoy poson*” ( Or rather decorticate fifteen grains of Cnide, and add to it, the *Indian preparation* ; ibid 158 ; Vol. VIII. p. 336 ). (c) “*Toyo to pharmachon odontas chathairei chai euodeas poieei chaleetai de indichon pharmachon.*” ( This preparation cleanses the teeth, and imparts to them a fine aroma ; it is called Indian preparation ; ibid 185 ; Vol. VIII. p. 366 ). (d) “*Eteron prostheton echlepsas chochchous triechonta, to indichon, o chaleousiloi Persai peperi.*” (Another pessary : thirty decorticated grains, and the *Indian substance* which the Persians call ‘pepper’; ibid 205 ; Vol. VIII. p. 394 ).

(4) *Indirect Inference* : Urine of cow

*(yo-mūtra)* is recommended as a therapeutic agent in fistula, in Vol. VI. p. 453 ; as a disinfectant wash for the female genitals and in sterility in Vol. VII. p. 365 ; in fumigation and lotion in female diseases in Vol. VIII. p. 211. Cow-dung (*go-maya*) is recommended with aromatic substances as a fumigation in female diseases in Vol. VIII. p. 119. ; bovine desiccated bile (*go rochanā*) as a vulnerary preparation for wounds in Vol. VI. p. 415 ; in a purgative compound in Vol. VI. p. 419 ; in pessary with myrrh and honey in Vol. VIII. p. 59, 157, 203, 395 ; as a laxative drink with wine in Vol. VII. p. 425. The cow being regarded as the sacred animal of the Hindus, it can be imagined that her excretory products may be used in India as therapeutic agents, but their use among the Greeks who had no such passions, indicates their foreign importation.

It may be said that all the writings that are now included in the Hippocratic Collection were not the genuine works of Hippocrates (460--377 B. C.). That may be so. We are not concerned with that problem. It suffices for our purpose to know that the Hindu thoughts influenced deeply the Greek medical literature in the fifth and the fourth century B. C. We do not yet definitely know how the Medical science reached

Hellas ; perhaps by the Persian intermediaries, or directly by the Hindu settlers in the Persian Empire. We know that in 606 B. C. the Median king Cyaxares conquered Assyria and annexed to it the territories up to the coasts in Asia Minor where there were many Hellenic settlers. Cyrus, ( 559—530 B. C. ) the great Persian nation-builder, defeats Astyages and conquers Media in 550 B. C., defeats Croesus, the Lydian king, and captures Sardis in 547 B. C., conquers Babylon and Greek cities of Asia Minor in 546—539 B. C. His son Cambyses ( 529—522 B. C. ) conquers Egypt in 527 B. C., by defeating the Egyptian ruler Psammetichus III or better known as Amasis, under whom were numerous Ionian and Cartan mercenaries. The empire of Darius I ( 522---486 B. C. ) extends from Macedonia to the Indus, and from the Danube and the Black Sea to Nubia ; while in 512 B. C. Darius invaded Scythia, to subdue the nomadic hordes, his general Megabazus reduced Thrace, and a few years later penetrated up to the river Peneus in Thessaly ; the Ionians revolted against the Persian domination, and with the assistance of Athenians and Eretrians, burnt Sardis in 499 B. C., which led to the Persian invasion of Northern Greece in 492 B. C. under

the generalship of Mardonius, and of Attica in 490 B. C., which ended with the defeat of the Persians at the battle of Marathon on Sept. 12—490 B. C.

Siddhārtha Gautama (*the Buddha* 563—483 B. C.) entered into '*nirvāna*' in 483 B. C. after a strenuous life of many years' preaching. In *Mahāvagga* (l. 6; l. 8) a very old Buddhist work of the fifth century B. C., we find description of advanced medical treatment.

But the Hindu influence over Greece even goes beyond that period. There is every reason to believe that the Dionysos orgies were the imported Soma-Śiva cult from India. Dionysos is a Moon-god like Soma. He introduced wine-culture (and civilization) into Hellas. The bull, the goat and the serpent are sacred to him. And he is represented like Śiva, as accompanied by a leopard, and in Alexandrian time, riding on a tiger (*Encyc. Brit.* Vol. VIII. p. 287). The Orphic religion seems to be no less indebted to the same source. Abstinence from meat, fish etc., from animal sacrifices, the wearing of a special garment, the practice of austere asceticism, belief in the transmigration of soul, and the soul will attain perfection, passing through various beings, and when it attains it, it will be free from rebirth—

the circle of generation' (*kyklos geneseos*), as the body is the bondage of the soul (Ency Brit. Vol. XX. p. 328)—all these unmistakably indicate pre-Buddhistic Indian origin, where these doctrines have been indigenous, and are still believed by the multitude. Arthur Lille in his '*Rama and Homer*' argues that in the Rāmāyaṇa, Homer found his theme for his great epics for the following reasons : (1) Like the two inseparable brothers in the Rāmāyaṇa, Rāma and Lakṣmaṇa, in the story of Menelaus, there are also two inseparable Greek brothers. (2) Rāma and Lakṣmaṇa have been banished by the conspiracies of a stepmother while the Greek brothers are banished from Argos by their usurping uncle Thyestes. (3) Sītā is born of a swan's egg (*Brahmā's emblem*) in a furrow, Helen is also born from a swan's egg left by her mother, Leda, the swan, and Helen emerged from her egg in a 'yperwon' which means a furrow. (4) At the '*svayamvara*' Rāma defeats all the competing princes, and Sītā chooses him as her husband, and in Greece, Menelaus is made to defeat all the competing princes, and wins Helen, though neither a competing tournament for winning a bride, nor the choosing of a husband (*svayamvara*) was

customary in Greece, and they were time-honored institutions in India. (5) Whilst Rāma is away, Sītā is carried away to Laṅkā across the sea ; likewise Helen is carried away across the sea to Troy. (6) Vibhīṣaṇa from a high hill points out to Rāma the principal warriors of the forces of Rāvaṇa ; Helen points out to Priam the chief Greek captains, after nine years of war and who came to rescue her. (7) The arrows of Rāvaṇa and the arrows of Hector come back to their hand after their flight. (8) As Hanumān with a mighty shout daunts the whole of the army of Rāvaṇa, so Achilles with a mighty shout daunts the whole of the Trojan army. (9) The heavens rain blood as an omen of the coming death of Rāvaṇa, and when the favorite son of Zeus, Sarpedon, is about to die, Zeus and Hera see a shower of blood falling on the battle-field. (10) The Hindu besiegers fare badly in the early encounters and Rāma proposes to bring the army back to India ; the Greek besiegers fare badly as well and Agamemnon proposes to carry the army back to Greece. (11) In the Rāmāyaṇa the Rākṣasas are depicted to be as big as mountains ; Mars, when thrown down by angry Pallus who flings a rock at him, covers seven acres with his

gigantic body. (12) In the Hindu epic, the gods and the demons gather round to watch the crucial battles between the paramount chiefs Rāma and Rāvaṇa ; in the Iliad, the opposing gods also crowd round to watch the course of the battle, though the chiefs are not paramount, nor the encounter crucial. (13) Kuvera, the god of wealth, and Śiva, the god of death, throw dice ; in the Iliad, Jove suspends golden scales. (14) When Sītā makes her determination to starve to death, Indra comes down and gives her the ‘*amṛta*’—the immortal food ; when Achilles is of the same frame of mind, though he was not a wronged party, Jove sends down Minerva with the ambrosia for him. (15) Vibhīṣaṇa is the wisest denizen in Laṅkā ; Antenor has the same reputation in Troy. When Rāvaṇa is about to kill Hanumān, the ambassador of Rāma, Vibhīṣaṇa remonstrates and saves his life ; when Menelaus and Odysseus came into Troy as ambassadors, they would have been killed, but for the intervention of Antenor. Vibhīṣaṇa advises Rāvaṇa to give up Sītā ; Antenor advises Paris to give up Helen. Vibhīṣaṇa conspires against his country with the enemy, shows the enemies how to pass the sea, reveals the secrets of the ‘*chaitya*’ of

Nikumbhilā ; Antenor also plots secretly against his own country, and advises Ulysses to seize the Trojan Palladium, and make the wooden horse. Vibhīṣaṇa, after the death of his brother and the capture of the city, becomes the crowned king of Laṅkā ; Antenor founded a new kingdom out of the ruins of the old. (16) Rāma is loaned by the supreme god, his chariot with the celestial charioteer—Mātali, and the terrible missile '*Brahmasīras*' which alone can kill the ravisher of Sītā, and the fiend of the gods. Achilles, the avenging hero, not the wronged husband, is given the coat of arms from the anvils of Vulcan, the chariot with the deathless steeds of Jove, and the charioteer Automedon who alone can drive such steeds, but he lacks the terrible '*arrow of Philoctetes*' which alone can kill the ravisher of Helen, and instead of killing the foe, he is himself killed by that foe. (17) Inconsistency and the lack of unity of the Homeric plot, and the invulnerable logic and conclusion of Vālmīki's story : cattle-stealing and wife-stealing being then the prevailing custom in Hellas, and Helen being carried off by a fop, and not a fiend of the gods, it could not have precipitated a war between two peoples.

Then the question arises as to the age of Suśruta and Charaka Saṃhitās, and that is very hard to determine with any positive certainty. All that we know is that the great Buddhist scholar Nāgārjuna revised the old Suśruta, and added to it the supplementary section (*uttara-tantra*). Nāgārjuna was a leading director of Kaniṣka's Council that was held about 78 A. D.. He salutes Suśruta in the beginning of the work (*Suśruta I. I*) with Brahmā, Prajāpati, the Aśvins, Indra, and Dhanvantari. It must have taken centuries to have made Suśruta a mythical figure, and to be classified with the gods. Charaka is mentioned in the Chinese Buddhist chronicles, as the family-physician of the Indo-Scythian king Kaniṣka (about first century A. D.), and who attended at a difficult child-birth of his wife. But Charaka is a family name, and there is an old Vedic Charaka school, known as Kapiṣṭhala Charaka (I. 1. 3). The internal evidence of both the works indicates that they were composed in pre-Buddhistic times, though there are numerous interpolations of a later age. The '*Sūtra-sthāna*' (Section of General Principles) and the metrical portions which are more or less explanatory, seem to be later additions. Not only do the prose versions resemble the Brāhmaṇas in composition,

but all the gods also are post-Vedic, and the common use of meat, especially beef ( Charaka I. 2, 18 ; Suśruta I. 46. 89 ), points out to a pre-Buddhistic age. The osteological nomenclature used in Suśruta is almost identical with that used in Atharva Veda ( X. 2 ), and in the Śatapatha Brāhmaṇa ( S. B. E. Vol. XLIV. p. 164 ). It is possible that the sage Yājñavalkya whose name is mentioned in the Brāhmaṇas, and in association with the King Janaka, the reputed teacher of the 'Vājasaneyi Saṃhitā' ( the White Yajur-Veda ), and the Law-book is the same person, and he lived about sixth century B. C. And the King Janaka of Mithilā might have been known as 'Kāsi-rāja' and Divodāsa. It may be said that the Hindu medical science could not make such a rapid advancement from the primitive magic charms and sorceries of the Atharva-Veda period, which has been put at 1000 years B. C. It is true that the 'Āyurveda' (medical science) claims to be a branch of the Atharva-Veda, as the priest is the successor of the magician, and the medicine-man is a magician priest. But the Atharva Veda contains many of the oldest superstitions of the Indo-Dravidian masses, and they did not become embodied in the Rg-Veda, simply because they represented the attitude of the masses rather

than that of the nobility. And when they became hoary with age, they became entitled to respect, and became admitted in the sacred book. The Charaka is older than the Suśrata, for in anatomical description, physiological explanation, in the classification of subject-matter, in the form of language and in the therapeutic technique, it represents a more ancient school. As there are many passages that are common, it seems that they were borrowed by the latter from the former.

In the following pages, I have tried to interpret and explain the *Ancient Hindu Medicine*, principally based upon Charaka and Suśrata in modern medical terminology. Translation is an ungrateful task, especially of technical subjects, written nearly twenty-five centuries ago, their modes of expression being quite different from those of the present age. However, I have tried to be as careful and accurate as possible. The translation could be much improved by transposition of words, or outstretching their meanings. I have preferred accuracy to diction, and I have often sacrificed, whenever it has been necessary, a good literary form, to make it as true to the original as possible and to reflect its meaning.

Yet it is very likely that some of my inter-

pretations may not find ready acceptance in many orthodox quarters. But sooner it is realized, it will be better for the communal health, that the ancient medical works can not serve us to-day any other useful purpose than to supply rich materials for the cultural history of the race. Its prolific vocabulary might be also profitably utilized to create a National School of Medicine, for continuity of historic consciousness activates and acts as a stimulus for progress. And it is well to know and remember that many of the medical books before they come from the press need revision to be up-to-date, and most of them, before they are ten years old, are almost antiquated. Bacteriology, micro-biology, chemistry, bio-chemistry, non-irritant antiseptics, prophylaxis, serum-therapy, organo-therapy, skiagraphy and the mechanical appliances have completely revolutionized during the last generation in method and technique '*the treatment and prevention of disease,*' which is the object of Medical Science (*Susruta I. 1. 12*). Our very great achievements in the past, which we have every reason to be proud of, instead of inspiring us with the greatest efforts to lead in arts and sciences, should not mortgage our future to the *Dead Past*. For a race that does not take the utmost care and the most

advanced methods for the prevention of disease and the preservation of health, can not effectively compete in the struggle for existence, with more forward races, and succeed in the survival of the fittest. Health is the foundation of all wealth and progress. We can not afford to cling to an empty shell, carry the dead weight of the past on our back, sacrificing our future, unless we want to be counted with the extinct races.

At the other extreme, there may be some who will contend that I have made a free ride on the wings of imagination, and there could not be such an advanced medical technique in the remote past. I want them to follow closely the original text. I suffer from no national hypnotism or megalomania. Exaggeration, on the other hand, I believe, is apt to lower the intrinsic value of a thing. Have I been subconsciously influenced by the sense of the grandeur of the country, as an expression of suppressed or subdued patriotism? I leave that for the readers to judge. I have always believed that in ancientness—Egypt, in social polity—China, in art—Greece, have nobler records of fundamental value than India can boast of. I admit, with all her faults, I love my country. I take pride and glory in

her past achievements. Tremors of her new awakening from the slumber of centuries, have sent me joyous thrills, made me vibrant with emotions and intoxicating dreams. And I live to see that she will contribute her share, worthy of her past, promising of a bright and brighter future, to the advancement of Human Civilization, and take her leading place in science and culture, and in the Council of Nations. But when studying history, intellect should not and does not need to be influenced by a gamut of sentiments and feelings, and can be left free to exercise its supreme prerogative to judge facts as they are on their own merit. I have tried to keep that attitude of my mind—not to corrupt my intellect with emotions. In studying the medical history of India, one should not be misled by the prevailing pathetic condition,—lack of hygiene, vicious dietary of the rich and the poor alike, ignorance and ineptitude of the medical practitioners, and the credulity of the public, for progress is not always steady and continuous. Except in the application of the mechanical developments and the appliances of machine power, modern nations have hardly made any further advancement in pure arts and literature than the Greeks. Medieval Europe, after the

destruction of the Greek States and the downfall of the Roman Empire, sank deeper in superstition and ignorance. In medical science the name of Galen (Claudius Galenus 130—201 A. D.) remained as the only supreme authority in Europe up to the seventeenth century, and in the Saracen empire up to the fourteenth century. The Arabs formed an eclectic school of medicine out of the synthesis of the Greek and the Hindu systems. In India medical science had its highest expression under the Buddhist rule when the relief of pain, human as well as animal, was regarded as a state religious duty, and hospitals were built in every important locality for men as well as animals. In the famous Buddhist universities of Takṣaśilā and Nālanda, there were thousands of students from all parts of India and Outer-India who went there to study medicine alone. With the downfall of the Buddhist states, and the dispersion of the monks, whose principal duties were to administer to the sick, the acquired knowledge virtually disappeared from India, and healing became the profession of the mendicants by magic charms and incantations, or of the quacks, charlatans and barbers.

It is possible, however, that though I have

been careful in the selection of the equivalent scientific terms for the Sanskrit, a few minor ones may need revision. I have labored under great disadvantages. Though New York Libraries are splendid institutions, and grant liberal privileges and easy access to the books, there are very few books on Indian Medicine, and I have not been able to avail myself of any book on the subject. Moreover it is very hard to write competently for one individual on all subjects dwelt on in Charaka and Suśruta Saṃhitās, and as they are the product of a medical assemblage —the collected wisdom of the sages that gathered together from all parts of India, as the drugs clearly indicate, and Agnivesa and Suśruta might have simply acted as secretaries (Charaka I. 1. 3), so their interpretation could be best done by a medical association with competent departmental heads on all subjects dealt with in those works. Mine has been simply a pioneer attempt, knowing not whether this task has been undertaken by any efficient Indian medical organization, and I have had to work single-handed, without any advice from any source. This, I understand, can be no excuse or justification for any misleading statement or false conclusion, and I shall be

grateful to my readers to have them pointed out.

For transliteration, I have used the following method :—

अ = a	क = k	ड = d	म = m
आ = ā or ḏ	ख = kh	ढ = ḏh	य = y
इ = i	ग = g	ण = ṣ	र = r
ई = ī i, or ḫ	घ = gh	त = t	ल = l
उ = u	ঢ = ṱ	থ = th	ব = v
ऊ = ū or ü	চ = ch	ঢ = d	শ = ś
এ = e	ছ = chh	ঘ = dh	ষ = ś
ऐ = ai	জ = j	ন = n	স = s
ओ = o	ঝ = jh	প = p	হ = h
ঔ = au	ঞ = ñ	ফ = ph	ঢ = ṡ
ঝ = ṙ	ট = t̪	ব = b	ঢ = ḡ
ল = !	ঢ = ḏh	ভ = bh	

I regret very much that it will not be possible for me to add an index to this book. This work has already taken more than double of the time I anticipated it would require, and the pressure of other works does not permit

me to devote more time to it. Under these circumstances, I beg leave to bring to a conclusion the arduous task, I so light-heartedly undertook.

July 22—1922

364, West 120th Street, C. CHAKRABERTY  
New York.

# **AN INTERPRETATION OF ANCIENT HINDU MEDICINE.**

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## **ANATOMY.**

The ancient Hindu physicians lacked profound and accurate anatomical knowledge. They have left more or less superficial, vague and imaginary description of the human anatomy, as found in their treatises, except in osteology. There is nothing astonishing in this. The Hindu medical science developed in the Buddhistic period for alleviation of physical sufferings. The Buddhists regarded all life as sacred. They naturally regarded with horror the idea of inflicting pain, and of depriving an animal of life for experimental medicine. In a tropical climate, as a hygienic measure, cremation of the dead has been ordained as a religious duty from misty antiquity. So there was no regular chance for human dissection and to acquire the exact

knowledge of human anatomy. Whatever knowledge they acquired, they obtained it from personal observation and experience, from caring for the wounded and disabled on the battle-fields, from a comparative study of the animal anatomy from the sacrificial animals in the pre-Buddhistic period. There is no record of the custom of human sacrifice, except the legend of Śunahsepa (*Aitareya Brāhmaṇa*, VII.3), as the act was repudiated by all presiding priests of the Rājasūya ceremony. If it was a mock-belief as a reminiscence of the remote past, it, however, clearly indicates that human sacrifice was no longer countenanced by the Vedic priesthood and was not practised in the post-Vedic Sūtra period. The students of surgery were taught the technique of instrumental operation on dead animals and vegetables, as water-melon, cucumber, pumpkin, gourds or skin-bags filled with water (*Suśruta*, I. 9. 2-5). Under these circumstances, proficiency was not possible.

Neither in Greece was it better. In the time of Hippocrates, the anatomical knowledge was very defective and superficial. No differentiation was yet made between the arteries and the veins and both were called 'phleps'—blood-vessels.

However, this distinction was made by Polybus, but on the whole his anatomical and physiological knowledge was erroneous. But Aristotle (*B. C. 385-322*) by his comparative study of animals, laid the foundation of positive anatomy and physiology. In his '*History of Animals*,' he devotes two-fifths of the work, the first four books, to the structural constitution of animals. He synthesizes all the knowledge of the time on the subject and corrects many inaccurate and misleading impressions of his predecessors. But he confuses, like Charaka and Suśrata, bones with cartilage and ligaments. He had vague ideas about nerves (*neura*) and identified them with the tendons, arising from the heart and he regarded the aorta as the nervous vein (*neurodes phleps*). And the human anatomy was not studied with experimental observation and dissection before the famous Alexandrian schools attracted the best intellects of the age under the patronage of Ptolemy Soter (*B. C. 323-282*). Erasistratus and Herophilus were both celebrated anatomists of antiquity. They acquired a tolerably sound knowledge of the organs and their functions, not only by animal but also by human dissection and experimentation. Erasistratus found out that the nerves originated from

the brain and Herophilus distinguished them into those of sensation and voluntary motion. Herophilus also wrote a treatise on the liver, which Galen has transmitted among his writings. Galen (130-200 A. D.), the really accurate anatomist of antiquity, went to Alexandria to study medicine under the famous anatomist Heraclianus, and Claudius Galenus of Pergamum can be called the founder of exact medical science by his vast erudition, scholarly research and his accurate clinical observation, and no wonder, for generations, his writings have held unchallenged authority both in Europe and Asia. The Arabic schools of medicine regarded him almost as infallible.

Herodotus (*B. C. 484-427*) mentions in his history II. 85, that the Egyptian medical profession was very advanced and learned, and it specialized in different diseases. But there is nothing left but a fragment of papyrus of the sixteenth century B. C. to indicate the extent of the medical knowledge of the ancient Egyptians. In this papyrus, it is found that the heart, vessels, liver, spleen, kidneys, ureters and bladder were recognized and the blood-vessels came from the heart. Their vessels are described, some carrying air, some mucus, while two to the

right ear are mentioned to carry the breath of life and to the left ear, the breath of death. (*Journal of Anatomy and Physiology*, vol. **XXXII.** P. 775). Even in the third millennium B. C. the Babylonians possessed quite to a praise-worthy extent the knowledge of the liver which they regarded as the seat of life. The Chaldeans uscd the liver of the sacrificed sheep for the divination of events. In the code of Hammurabi about 1900 B. C. it seems that the Babylonian medical art had already attained a marvellous efficiency, as the operation on the eye is mentioned with bronze lancet as a regular professional daily business. And a successful eye-operation is not possible without a thorough anatomical knowledge of its structure.

## 1. OSTEOLOGY

Parts of the body.	Number of bones according to modern anatomical Text-books	Charaka	Sushruta	Hippocrate <sup>s</sup>
<b>I. Four Extremities.</b>				
Phalanges ( <i>aṅguli</i> ) Bones of fingers and toes	$14 \times 4 = 56$ ,	$15 \times 4 = 60$ ,	$15 \times 4 = 60$	
Metacarpus ( <i>śulākā</i> ) Long bones of the palm	$5 \times 2 = 10$ ,	$5 \times 2 = 10$ ,	$5 \times 2 = 10$	
Metatarsus ( <i>śulaka</i> ) Long bones of the anterior portion of the foot	$5 \times 2 = 10$ ,	$5 \times 2 = 10$ ,	$5 \times 2 = 10$	<b>Hands</b>
Carpus (1. <i>adhiṣṭhāna</i> ; 2. <i>kirchha</i> ; 3. <i>gulpha</i> ) The wrist-bones	$8 \times 2 = 16$ ,	$5 \times 2 = 10$ ,	$5 \times 2 = 10$	<b>27</b>
Tarsus (1. <i>adhiṣṭhana</i> ; 2. <i>kurv'icha</i> ; 3. <i>gulpha</i> ) Ankle-bones	$7 \times 2 = 14$ ,	$5 \times 2 = 10$ ,	$5 \times 2 = 10$	<b>Feet</b>
				<b>24</b>

## ANATOMY

7

<b>Os calcis (<i>pārṇī</i>)</b>	<b>*1 × 2 = 2,</b>	<b>1 × 2 = 2,</b>	<b>1 × 2 = 2,</b>	<b>1 × 2 = 2</b>
<b>Heel</b>				
<b>Styloid processes of the wrist (<i>manīka</i>)</b>	<b>—</b>	<b>2 × 2 = 4,</b>	<b>1 × 2 = 2</b>	
<b>Tibia and Fibula (<i>taṅghā</i>)</b>				
<b>The leg bones</b>	<b>2 × 2 = 4,</b>	<b>2 × 2 = 4,</b>	<b>2 × 2 = 4</b>	
<b>Radius and Ulna (<i>aratni</i>)</b>				
<b>Bones of the forearm</b>	<b>2 × 2 = 4,</b>	<b>2 × 2 = 4,</b>	<b>2 × 2 = 4</b>	
<b>Patella (<i>jānu</i>)</b>				
<b>Knee-cap</b>	<b>1 × 2 = 2,</b>	<b>1 × 2 = 2,</b>	<b>1 × 2 = 2,</b>	
<b>Olecranon (<i>kūrpaṭa</i>)</b>				
<b>Elbow process</b>	<b>—</b>	<b>1 × 2 = 2,</b>	<b>1 × 2 = 2</b>	
<b>Femur (<i>uru</i>)</b>				
<b>Thigh-bone</b>	<b>1 × 2 = 2,</b>	<b>1 × 2 = 2,</b>	<b>1 × 2 = 2</b>	
<b>Humerus (<i>bāhu</i>)</b>				
<b>The bone of the upper arm</b>	<b>1 × 2 = 2,</b>	<b>1 × 2 = 2,</b>	<b>1 × 2 = 2</b>	
				<hr/>
	<b>120</b>	<b>122</b>	<b>120</b>	<b>51</b>

\* Included among the Tarsus bones.

## II. The Trunk.

Parts o' the body	Number of bones according to modern anatomical Text-books	Charaka	Susruta	Hippocrates
Clavicle ( <i>akṣaṅka</i> )				
Collar-bone	$1 \times 2 = 2$	$1 \times 2 = 2$	$1 \times 2 = 2$	
Scapula ( <i>amṛta</i> )				
Shoulder-blade	$1 \times 2 = 2$	$1 \times 2 = 2$	* $1 \times 2 = 2$	
Sternum ( <i>bakaṭa</i> )				
Breast bone	1	17	8	
Ribs [ <i>pārśvaka</i> ]	$12 \times 2 = 24$	$36 \times 2 = 72$	$36 \times 2 = 72$	
Vertebrae : [ <i>spinal column</i> ] 12 Thoracic 5 Lumbar } <i>prsthē</i>	17	35	30	20

\* Enumerated among 'bakaṭa.'

## ANATOMY

Sacrum ( <i>triķa</i> )	1		1	1	5
Coccyx ( <i>guda</i> )	1		1		
Pelvis { Ilium ; Ischium					
{ ( <i>śroni-pħalaka</i> )	2		2	2	( <i>nilambā</i> )
Pubis ( <i>bhaga</i> )			1	1	
	<hr/> 50		<hr/> 133	<hr/> 117	<hr/> 25

### III. The Neck and the Skull

Vertebra Cervix (*grīvā*) 7

Trachea and Bronchi (*īatrū*)

The Windpipe

Frontal	1			
Parietal		2	( <i>čhañkṣu</i> )	
Occipital	1			
Sphenoid	1		4	( <i>mastaka</i> )
Ethmoid	1		6	skull
				8

Parts of the body	Number of bones according to modern anatomical Text-books	Charaka	Susruta	Hippocrates
OS Temporale ( <i>Saṅkha</i> )	2	( <i>hamu</i> )	2	2
Superior maxillary	2			
Inferior maxilla	1			
{Ossa faciei: Nasal( <i>nāśikā</i> )	2			
{Bones of the face. Vomer}	1			
Palate <i>tālu</i>	2		1	
Lachrymal	2			
Inferior turbinated	2			
Malar ( <i>ganda</i> )	2			
Hyoid	1	*		
The Ossicles of the ear :				
Malleus }				
Incus }	$3 \times 2 = 6$			
Stapes				$1 \times 2 = 2$

\* Enumerated among the 'grīvā'

Teeth ('lanta)	—	32	32
Sockets of teeth ( <i>udūkhala</i> ) —	—	32	—
Nails ( <i>nakha</i> )	—	20	4
		105	63
		36	35
I. The Four Extremities	120	120	51
II. The Trunk	50	153	117
III. The Neck and the			25
Skull	36	105	63
The total number of the human bones	206	360(1)	300(2)
		111	35

"With teeth, sockets of teeth and nails, there are altogether 360 bones in the whole of the (*human*) body. As the following :—sockets of teeth 32 ; nails 20 ; long bones of hand and feet 20 ; their bases 4 ; bones of fingers 60 ; heels 2 ; bases of the feet 2 ; wrist bones 4 ; ankle-bones 4 ; in the fore-arms 4 ; in the leg 4 ; knee-caps 2 ; elbow-pans 2 ; in the thighs 2 ; in the arms 2 ; collar bones 2 ; shoulder-blades 2 ; palate bones 2 ; the pelvic ring 2 ; ilium 1 ; sacrum 1 ; coccyx 1 ; back-bone 35 ; neck-bones 15 ; trachea 1 ; jaw bones 2 ; bases of the jaw bones 2 ; parietal 2 ; malar 2 ; nasal bones 3 ; ribs ; 24 ; thoracic ribs. 24 and sockets of the ribs 24 and altogether on the sides 72 bones ; temporal bones 2 ; frontal cranium 4 ; breast bones 17 ; altogether three hundred and sixty bones." Charaka IV.7.4.<sup>1</sup>

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1. Charaka IV. 7. 4 द्वौषिं चट्टाधिकानि शताब्द्याणां सह दक्षोलुखलनद्यः । तद्यथा, — शाविं शहनोलुखलानि, शाविं शहनाः, विश्वतिर्णङ्गाः, विश्वति. पाणिपादशताकाः, चत्वार्याधिभान्नासां, चत्वारि पाणिपादशृष्टानि, षट्टिरङ्गु-खल्लीनि, एव पाञ्चांगैँ शूर्चांधशतावरः पाण्डोर्मंसिकाचत्वारः पाद्योर्मुखफाः, चत्वार्य-रक्षोरस्थीनि चत्वारि जड्योर्जातुनोद्देशूर्पं रयोद्देशूर्पं कर्मोद्देशूर्पं वाह्नोः सांसर्याः । तावच्छकी, एव ताजुनि, एव शोणिफलकी, एकं भगास्ति, पुंसा मेठास्ति, एकं त्रिकर्त्तुष्ट्रितमिकं गुदास्ति, इष्टगतानि पञ्चतिंश्चत्, पञ्चदशास्थीनि दीपायां, एव जबुस्ते कं इन्द्रस्ति, एव इन्द्रुलूपस्ति, एव लक्षाटे, एव अच्छोद्देशे एव गच्छयोर्नां-सिकायां वैष्णि शोषाश्चानि, इयोः पार्वत्योशतुर्विंशतिशतुर्विंशतिः दक्षरात्मेनि च पार्वत्यानि तावनि वैष्णो ख्यालिकान्यव्युदाकाराणि, तानि विसर्पतिर्णैः शङ्ककी, चत्वारि शिरःकापालानि वैष्णो सप्तदशेति वैष्णि चट्टाधिकानि शताब्द्याणुमिति ।

"According to the medical men, there are 360 bones, but in surgery 300 bones are enumerated. Of these 300 bones, in the branches, that is in both the arms and feet, there are 120 ; in the pelvic region, back and the breast, there are 120 ; and above the trunk 63 : altogether there are 300 bones in the human body.

"Following are the 120 bones in the branches :—at every finger of the foot, there are 3—so 15 ; the foot-support (*metatarsus*), the ankle-bones and their base 10 ; heel 1 ; in the leg 2 ; in the knee-cap 1 ; in the thigh 1 ; so in one foot there are 30 bones : so in the other foot and arms.

"In the pelvis 5 as coccyx, ilium, pubis 4 and sacrum 1 ; ribs 32 one side and the same on the other ; back-bones 30 ; in the breast 8 ; shoulder-blades 2.

"In the neck 9 ; in the wind-pipe 4 ; jaw-bones 2 ; teeth 32 ; in the nose 3 ; palate 1 ; malar, temporal and ear bones 2 each ; in the cranium 6." Suśruta III. 5. 17-20.

Suśruta III. 5. 17-20 वीणि सर्पर्णीवस्त्रिशतानि वैद्यादिनो भाष्यको । श्ल्यतन्त्रे तु वौखेव शतानि । तेषां सविंशतिश्चितं शाखासु । सप्तदशीतरं शतं श्वासिपार्श्वपृष्ठोदरेष्टस् सु । येवां प्रत्यौर्हं विषष्टिः । एषमस्युं वीणि शतानि पूर्यन्ते ॥ १७

एककास्यानु पादाङ्गुल्यां वीणि वीणि,—तानि पञ्चदश । तलज्ञवृग्नुलक्ष्मिश्चितानि दश । पाण्डार्मिकम् । जङ्घायां ह । जानुव्येकम् । एकमूराविति विशदेवमिकचिन् सकृथनि भवनि । एतेनेतरसकथिताङ्गं च व्याप्त्यातौ ॥ १८

शोख्या पञ्च, तेषां गुदभग्नितन्त्रेषु चत्वारि, विकर्षंशितमिकम्, पात्रे चट्ब्रिंश्च-देवमिकचिन्; वित्तोदयेष्वेवम् । इहो विश्वत् । अष्टावुरसि । हे चत्वारसंज्ञे । १९

योदाया नवकम् । कष्ठगायां चत्वारि । हे इत्योः । इत्था चाविंशत् । नासाया वीणि । एकं तालुकि । गस्तकर्षशङ्कीचिकम् । चट्ब्रिंश्चिति ॥ २०

"The bones of the hand are 27 ; of the feet 4 ; of the neck up to the grand (*back-bone—shoulder blades*) 7 ; pelvis 5 ; back-bones 20 ; the head with eyes 8 ; in total 91 with the nails 111. As to man, the bones we have ourselves learnt to know are :—the back-bones above collar-bones with the grand (*shoulder-blades*) 7 ; the back-bones as well as those of the sides (*ribs 12 ; the back-bones that go farther the ribs in the pelvis 5.*") Hippocrates : *The Nature of Bones*, I. (*Peri osteon physios*).

From the above comparative table, it is evident that the Hindu anatomists, especially the Suśruta school, had a tolerably sound knowledge of **osteology**. The discrepancies in the figures are due to the fact that the Hindus counted the processes, cartilaginous structures and the teeth as bones. But they classified the bones into five kinds according to their nature of constitution. (*Suśruta III. 5. 21*). The nails—the epidermal formations were dismissed by Suśruta as bones. If the teeth were counted in the skeleton, it is because the teeth are bone-like, hard and strong. Histology is a recent science and it could not be known in ancient times that tooth is a calcified papilla of the mucous membrane. If the cartilages, especially

the costal cartilages of the ribs have been counted as the bones, it is because in the embryonic state all the bones are in cartilaginous condition and in certain diseases, the costal cartilages become ossified. Suśruta counts 30 as the dorsal and the lumbar vertebrae, for the reasons that the spinal column really consists of 33 irregular bony segments of which the upper 24 are separated during life by discs of spinous cartilaginous articular processes, and are therefore called "true" or "movable" vertebræ, in distinction from the lower 9 which are called the "false" or "fixed" vertebræ, for they become consolidated into the sacrum and the coccyx. The Hindu anatomists counted the constituent bones of the sacrum and the coccyx as separate bones as well as the spinous processes, belonging to the vertebræ. While the modern anatomists designate as vertebræ the upper 24 loose bones, consisting of the 'cervical' 7, 'dorsal' or 'thoracic' the succeeding 12, and the 'lumbar' the lower 5. The Hindu anatomists enumerated the cervical vertebrae as the 'grīvā' or neck bones, adding also to it the hyoid bone. In the wind-pipe (*kanṭhanati*) the four cartilages—cuneiform, arytenoid, thyroid and cricoid, were counted as bones. The

breast-bone is given by Suśruta to be 8, for he includes among the breast-bones the 2 collar bones and as the sternum really consists of three parts, the 'manubrium' which usually remains separate throughout life from the rest of the bone, the cartilaginous 'metasternum' and the 'corpus sterni' or 'mesosternum' which is formed by the fusion in early life of four segments.

So if we try to identify the nomenclature and designation of the ancient Hindu and the modern systems of osteology, it becomes clear that the Hindus had acquired a sound knowledge of the human skeleton. And the term 'skeleton' (*from the Gr. skeletos=dried*) is applied to the parts which remain after the softer tissues of the body have been disintegrated or removed and includes not only the bones, but also the cartilages and ligaments which bind them together (Cunningham : *Anatomy*, p. 67). In this generic sense the Hindus described their bony frame-work, but classified the bones into five kinds according to their composition as flat (*kapāla*), tooth (*ruchaka*), tender (*taruṇa*), strong (*balaya*) and hollow (*nalaka*) bones.

(3) "These bones are of five kinds as the following:—'flat' bones, 'tooth' bones, 'tender' bones,

'strong' bones and 'hollow' bones. The bones of the knee, pelvis, shoulder, malar, palate and the head are flat bones. The teeth are of 'tooth' bones; the nose, ear, neck and the eyesockets are of 'tender' bones. Those of the hand, foot, sides, back and breast are of 'strong' bones. The rest of the bones are 'hollow'." *Susruta III. 5. 21.*

## 11. ARTHROLOGY.

In *Arthrology*, that is, in the description of the articulations or joints (*Sandhi*), Suśruta shows also remarkable accuracy. "Joints are of two kinds—'movable' (*diarthroses*) and unmovable (*amphiarthroses*). In the four branches (*hands and feet*), in the jaw-bones and the loin, the joints are movable and the rest of the joints, the wise should regard as permanent (that is, of partial or incomplete movement).

"There are 200 joints in the body. Of them 68 are in the four extremities, 59 in the trunk and 83 above the shoulder (that is, in the neck and the head).

(3) एतानि पञ्चविधानि भवन्ति । तद्यथा—कपालरुचकतरुचयवलयगलकासंज्ञानि ।  
तेषां जातुनितम्बासुगण्डालुशङ्कशिरःसु कपालानि । दृश्नास्तु रुचकानि । ग्राणकर्णं-  
योवाचिकीविदु तद्वानि । पाणिपादपार्श्वपृष्ठोदरीरःसु वलयानि शिवाणि नलक-  
संज्ञानि ॥ ११ *Susruta III. 5, 21.*

"In every toe there are 3, except the great toe (corresponding to the thumb) which has two joints, thus  $14(4 \times 3 + 2 = 14)$ . The knee, ankle and hip has each a joint. So one foot has 17 joints ; the other foot likewise, as well as both the arms.

"In the pelvis 3 ; in the spinal column 24 ; in the sides (*ribs*) 24 ; in the breast 8 ; in the (*vertebral-cervical*) neck 8 ; in the trachea 3 ; in the conjunction joints of the heart and lungs 18(*hrdayaklomanibaddha*) ; in the sockets of teeth 32 ; 1 in the thyroid cartilage (*kākalaka*) and one in the nose ; 2 between the eye-sockets and the eyeballs (*dvau vartmamandalau netrāśrayau*). In the malar, temporal and the ears 6 ; in the jaw bones 2 ; on the top of the brows 2 ; in the cranium 5 and 1 in the forehead.

"These joints are of eight kinds as :—gynglym-oid (*kora*—a hinge joint), enarthrodial (*udukhala*=mortar-like in shape ball-and-socket joint), enarthrodial (*sāmudga*=cup-like), costo-vertebral (*pratara*=raft-like), circular (*mandala*), sutural (*tunnasevani*=sewing) and symphysic (*conch-shell like*) joints. Interphalangeal (*gynglymus*-simple hinge joints, surrounded by a capsule), radio-carpal (*condyloid-ellypsoidal*), the ankle-joint (*gynglymus*), the knee-joint (*gynglymus*), the elbow-joint (*gynglymus*) are all '*kora*' ; the shoulder-joint

(enarthrodial-ball-and-socket-joint), the hip-joint (enarthrodial), teeth-sockets (synarthrodial-immovable ?), are all 'udūkhala'; the sterno-clavicular joint (diarthrodial-freely movable), sacro-iliac joint (diarthrodial), symphysis pubis (amphidiarthrodial—a combined gliding and hinge joint), and lumbo-sacral joints (amphidiarthrodial) are all (sāmudga); cervical, dorsal and lumbar vertebral joints (limited amphidiarthrodial) are 'pratara'; the temporal and the cranium joints (sutural) are tunnasevani; trachea, heart, eye and lung-joints are mandala; the ear and the nose joints (sympathetic) are sankhāvartta. According to the shape of the joints nomenclature has been fixed. Only the joints of the bones have been described. The joints of the muscles, nerves and arteries are countless". *Suśruta III. 5. 23-29<sup>3a</sup>*

३a. शाखासु इन्वोः कव्यासु चे दावतसु सम्बयः ।  
शेषासु सम्बयः सर्वे विशेषा हि स्थिरा बुधेः ॥ २१

सङ्ग्रहासु दशोत्तरे वे शते । तेषां शाखासु एषादिः, एकोनषट्ठिः कौष्ठि, योषा प्रत्युषं दार्शीतिः ॥ २४

एकैकस्मा पादाङ्गुल्यां वयस्ययः, द्वावाङ्गुडे,—ते चतुर्दश । जानुगुल्फवङ्गुडे—  
चे कैकाः । एवं सप्तदशेकाश्चिन् सकृदनि भवन्ति । एतेनेतरसप्तक्षिणाह् च  
व्याख्याती ॥ २५

वयः कटीकपालेषु । चतुर्भिंशतिः पृष्ठवंशे । तावन एव पार्श्वयोः उदरसटी ।  
तावन एव योवायाम् । वयः कण्ठे । नाडीषु छट्यङ्गोमनिषत्पात्रास्टादृशः ।  
दक्षपरिमाणा दक्षमूलिषु । एकः वाक्यजै नासायाच । वै वर्ममस्तुजी निवाश्वी ।

### III. Myology

In myology, the muscular system, though Suśruta at first appears to be fantastical and vague, yet by comparative study, it can be easily seen that notwithstanding imperfection and clumsiness, there is some fundamental truth in the statement. Suśruta mentions 500 muscles (*peśi*) while Steadman's Medical Dictionary gives the names of 427 muscles. It is possible that Suśruta duplicates many continuous muscles and omits many deep-underlying muscles, especially of the upper part of the body.

	Muscles according to Suśruta.	Muscles according to Cunningham's Anatomy.
I. The Lower Exremity		
Toe	$3 \times 5 = 15$	3 ।
Fore foot	10	7
Ankle & Sole	10	9
Heel	10 2 tendons and 2 ligaments.	Leg and foot 25
Leg	20	12
Knee	5 3 tendons and - 4 ligaments.	

गणकाण्डशहृष्टे कौकः । दी हनुस्मी । शावपरिष्ठादभुवोः । शहयोथ । पच्छ  
शिरःकपालिषु । एको सूर्खिं ॥ २६॥२७

त एते सम्बयोऽप्यविधाः । कोरोद्भूलसामुद्रप्रतरुप्रसेवनीवायस्तुष्टुमस्तुलशङ्का-  
वर्ताः । तेषामहु लिमयिवन्धगुल्फजानुकूपरेषु कोराः सम्बयः कचावहुष्टुदयनेषु-  
द्भूलाः । अस्त्रीठगुदभगनितवेषु सामृद्धाः । योवाहुष्टुवेशयोः प्रतराः शिरःकटीकपालिषु  
तुष्टुसेवनी । हन्त्वोद्भयतव्य वायस्तुष्टुः । कग्नहुष्टुदयनेवक्तीमनाकृषु मस्तुलाः  
श्रोत्रप्रस्त्राटेषु शङ्कावर्ताः । सेवां गामभिरेवाज्ञातयः प्रायेष व्याप्त्वाताः ॥ २८  
चस्यानु सम्बयो छेते केवलाः परिकीर्तिताः ।  
पश्चोक्तायुशिराणानु सम्बिसङ्गा न विद्यते २९

Thigh	20	22	Thigh and buttock 25
Groin	10	8	and 2 ligaments.
<hr/>			100

## II. The Trunk of the Body

Pelvic region	3	2	Ischio-coccygeus and Levator Ani; but the 'Levator ani' is divisible into 4 parts.
Penis	1	Erector 1	Perineum 12
Spermatic cord	1	penis	Spermatic cord passing through 'cremaster' muscle.
Testes	2	1	Dartos muscle in scrotum.
Bladder	2	1	Compressor Urethræ
Stomach	5		
Breast	10	Thorax	
Abdomen	6	12	Anterior muscles of the Trunk 19
Navel	1	3	
Shoulder	7	5	
Back	16	16	There are 16 superficial and 15 deeper muscles in the back.
Buttocks	$2 \times 5 = 10$	8	

**Heart and Colon 2**      3    myocardium and masculi papillares tunica muscularis (colon).

### III. The Neck and the Head.

<b>The back neck 4</b>	<b>6</b>	
Jaws	$2 \times 4 = 8$	
Thyroid	$1 \times 2 = 2$	Thyro-hyoid, Stylo-hyoid and Sterno-hyoid.
Tongue	1	or 8. The 'extrinsic muscles': genio-glossus, hyoglossus, styloglossus and palato-glossus. The 'intrinsic muscles': superior lingualis, inferior lingualis, transverse fibres and vertical fibres.
Cheeks	$1 \times 2 = 2$	5
Nose	2	5, The mouth 11 (eleven)
Front neck	$2 + 2 = 4$	10
Eye	$1 \times 2 = 2$	7 in the orbit and 4 in the eye-lids.
Forehead	4	Frontalis 1
Palate	2	Occipitalis and The scalp 6
		Trapezius 2
<b>The top of the head</b>	<b>1</b>	Epicranial Aponeurosis
<b>Ear</b>	<b>2</b>	<b>3/</b>

#### IV. The Female Reproductive Organs

Mammae	$5 \times 2 = 10$	5 Pectoralis major, serratus magnus, ligaments of Cooper, aponeurosis and recto abdominis muscles.
Vagina	$2 + 2 = 4$ $2 + 3 = 5$	Tunica muscularis, rugae vaginales, and (common bulbo cavernosus, sphincter ani, externeus levator ani and erector clitoridis = erector penis).
Uterus	3	3 Ligamentum latum uteri (broad ligament), ligamentum teres uteri (round ligament) and the muscular 'corpus uteri'.
Fallopian tube	3	3 Tunica muscularis, ligamentum ovarium proprium and mesovarium.

"There are 500 muscles [*pesi*]. 400 of them are in the 4 extremities, 66 in the trunk, and 34 above the shoulder (in the neck and the head).

"The toes (*pādāṅguli*) of each foot have 15 muscles, having 3 muscles for each toe ; 10 in the fore-foot (*pādāgre*) ; 10 in the heel (*kūrcha*) ; in the ankle and the sole (*gulpha-talayoh*) 10 ; between the ankle and the knee (*gulpha-jānvantare=leg*) 20 ; 5 in the knee (*jānu*) ; 20 in the thigh (*uru*) ; 10 in the groin (*rāṅksāṇa*) : thus in one foot there are 100 muscles ; so in the other foot and the two arms.

"In the pelvis (*pāyu*) 3 ; in the penis (*medhre*) 1 ; in the spermatic cord (*sevani*) 1 ; in the testes (*vṛṣan*) 2 ; in the buttocks (*sphicha*) 5 each ; in the upper part over the bladder (*vasti-sirasi*) 2 ; 5 in the stomach (*udara*) ; in the navel (*nābhi*) 1 ; in the upper back (*prsth-ordha*) 5 longitudinal (*muscles*) on each side ; in the sides (of the spinal column = *pārśva*) 6 ; 10 in the breast (*Vakṣa*) ; in the shoulder (*akṣakāṁsa*) 7 ; 2 in the heart and colon (*hrdayāmāśaya*) ; 6 in the spleen, liver and the lower intestine (*yakrt-plihā-uṇduka=abdomen*).

"In the back part of the neck (*grīvā*) 4 ; 8 in the jaws (*hanu*) ; in the thyroid cartilage (*kākalaka*) 2 ; in the palate (*tālu*) 2 ; in the tongue (*jihrā*) 1 ; in the cheeks 2 ; in the nose (*ghoṇa*) 2 ; 2 in the eyes (*netra*) ; in the front neck (*gaṇa*) 4 ; in the two ears (*karṇa*) 2 ; 4 in

the forehead (*lalāṭa*), and 1 (*one*) on the top of the head (*śirasi*).

"A woman has 20 more muscles than man : 10 in the two mammae (*stana*) at 5 each, which are developed in adolescence ; in the vagina (*apatyapatha*) 4, two in the entrance and two in the interior ; in the uterus (*garbha-cchidra*) 3 and in the fallopian tubes (*śukrārttava-pravesa*), the muscles are 3.

"According to the position, the muscles are grouped together (*vahula*), isolated (*pelava*), thick (*sthūla*), thin (*sūkṣma*), extensive (*prthu*), globular (*vr̥tu=tendon*), short (*hrasva*), long-cylindrical (*dirgha*), hard (*sthira*), soft (*mrdū*), smooth (*ślakṣṇa=unstriated*, that is primitive involuntary muscles), striated (*karkaśa=voluntary muscles with transverse stripes*), and they cover the joints, bones, arteries and nervous fibres according to their respective needs.

"The muscles that have been mentioned of men in their penis and testicles, cover in women their interior reproductive organs."

*Susruta III. 5. 37-45.*<sup>4</sup>

4. पञ्च पेशीशतानि भवन्ति । तासां चलारि शतानि शाखासु । कोषे षट्खण्डः ।  
बीबा प्रत्यूर्हं चतुस्तिंशत् ॥ १०

एकैकस्तान्तु पादाङ्गुल्या तिक्ष्णिष्वत्ताः पञ्चदशः । दश प्रपदे । पादोपरि  
शूर्वसंज्ञिविद्वासावत्य एव । दश गुण्फलतयोः गुण फलान्वलरि दिशतिः । पञ्च जातुनि ।

The difference between Suśrata's 500 muscles and Stedman's 427 muscles, which if counted separately like Suśrata on both sides of the body would amount to nearly 800 muscles, can be easily accounted for by the fact that not only the modern classification and nomenclature of the muscles are different from the

विश्विलही । दश वसुषे । शतमेवनिकालिम् सकृदनि भवग्निः । एतेनेतरसकृदिवाइ  
च व्याख्याती ॥ १८

तिक्ष्णः पायोः । एका मेडुः । सेवन्नाशापरा । वे हवचयोः । लिङ्गोः पच-  
पच । वे वस्त्रशिरसि । पचोदरै । नाभामिका । पृष्ठोहंसलिंगिदाः पच पच दीर्घाः ।  
षट् पर्वतयोः । दण्ड चचसि । अचकासौ प्रति समन्वात् सम । वे हृदयामाशययोः ।  
षट् यज्ञातप्तीष्ठोखुकिषु ॥ १८

योवाया चतुरः । अट्टी इन्द्रिः । एकेका काकलकगलयोः । हे तालुणि ।  
एका जिह्वायाम् । ओहयोहै । ओशायां हे । हे नेत्रयोः । गल्योशतमः । कर्षयोहै ।  
चतुर्जो लक्षणार्थे । एका शिरसि इत्येवमितानि पञ्च पैद्योष्ठानि ॥ ४०

शिरावाय स्थिपत्त्वाणि सम्बयस्तु शरोदिष्टान् ।

पैशोभिः संहतान्यव बलवन्ति भवन्तप्रतः ॥ ४१

म्बीणाम् विश्वतिरधिका । दश तासां क्षमयोरेकैकस्थिन् पञ्च पञ्च, यीदने तासां परिहङ्गिः । . अपव्यये चतुर्भुवः, तासां प्रस्तुतेऽध्यन्तरतो ह, सुखाश्रिते वाच्ये च प्रहृते हैं । गर्भस्त्रिद्रुष्टि शितालिकः । शुग्राणां वप्नवेश्यत्वस्त्रिक्षम् एव ॥ ४९

पितृपक्षाशयमध्ये गर्भाशयो यद गर्भस्तिष्ठति ॥ ४५

तासां वहुलपेतस्यूलाकुपृथुडत्तक्षसदर्थसिरमुद्गामाकंशभावाः सन्धासि-  
विराजायप्रक्षादाका यथादिर्यं स्वभावत एव भवन्ति ॥ ४

भवति चाव—पुंसा पेशः पुरस्ताद्याः प्रोक्ता सर्वशब्दानुष्ठानाः।

स्त्रीकामाहन्य तिष्ठति फलमन्तर्गतं हि ताः ॥ ४५ ॥

ancient Hindu system, but Suśruta did not include the tendons (*māmsa-rajjū*) and ligaments (*sīmanta*) in the muscular order. It is evident from close comparative study that the Suśruta school of anatomy had tolerably sound knowledge of the human muscular system for all practical purposes.

Suśruta mentions 14 joints of more than 2 bones (*samghāta*) which are held together by a band or sheet of fibrous tissue, which he calls '*sīmanta*' that is ligament. He enumerated them in the following junctions :—"Three are in each foot at the ankle (a joint of *tibia*, *fibula* and *astragalus*, held together by,—*anterior tibio-fibular ligament*, *posterior tibio-fibular lig.*, *talo-fibulare anterius*, *calcaneo-fibulare*, *talo-fibulare posterius* and *ligamentum deltoideum*), at the knee (a joint of the *femur*, *tibia*, capped by the *patella*, held together by *ligamentum patellae*, *lig. Posticum Winslowii*, *lig. collaterale tibiale*, *lig. collaterale fibulare* and *ligamenta cruciata genu*), at the hip-joint (of the *femur*, *ilium* and *pubis*, held together by *lig. Transversum acetabuli*, *lig. ilio-femorale*, *lig. pubo-femorale*, *lig. ischio-capsulare*, and *lig. teres femoris*) ; so in the arms at the wrist (a *radiocarpal articulation* between the *radius* and the

*scaphoid, semilunar and cuneiform bones, held together by the external lateral ligament, internal lateral ligament, anterior and posterior ligaments), at the elbow (a joint of humerus, radius and ulna, held together by the anterior and posterior ligaments, lig. collaterale ulnar and lig. collaterale radiale), and at the arm-pit (the shoulder-joint of the head of the humerus, glenoid fossa of scapula and the coracoid process, held together by labrum glenoidale, capsula articularis and ligamentum coraco-humerale).* According to others, there are 18 (ligaments). The above-mentioned 14, one at the pelvis (*sacro-iliac joint of sacrum, ilium and pubis, held together by lig. sacro-iliacum anterius, lig. sacro-iliacum posterus breve, lig. sacro-iliacum posterus longum, lig. ilio-lumbale, lig. sacro-tuberous, lig. sacro-spinosum, lig. pubicum posterius, anterius, superius and inferius*), at the upper-breast (*sterno-clavicular joint of the sternum and clavicles held together by lig. sterno-clavicularis and lig. rhomboidale*) and the lower-breast (*sterno-costal joints of the sternum and the seven costal cartilages held together by lig. costo-sternalium radiatum, ligg. sterno-costalia interarticularia*) and at the neck (*scapulo-clavicular joint held together by lig. coraco-claviculare, lig.*

*conoideum* and *lig. trapezoideum*) *Suśruta III.*

5. १५-१६<sup>८</sup>

It is very likely that Suśruta by 'śimanta' means only the synovial capsule and the membrane which are usually found at the joint of more than two bones and which he calls 'sam-ghūta'. By the general term 'sandhi' he has designated the articular joint and which he has enumerated as 210 and the fibrous band which binds the bones at the joints together (*ligament*) and the muscles to the bones (*tendons*), whether it is ligamentous or tendonous, he calls by the common designation 'snāyu'-‘to bind’ and which he describes to be nine hundred (III. 5. 30.) And the large and strong tough fibrous longitudinal bands and chords are called ‘kandara’.

“*Kandaras* are 16 : 4 in feet (*tendo achilis* in the leg and *semimarbransus tendon* in the thigh), 4 in the arms (*supinator longus tendon* in the forearm, and the *semilunar* or *biceptial fascia tendon* in the arm,) 4 in the neck (*sterno-cleido-mastoid tendon*, *membrana tectora*, *membrana atlanto-occipitalis posterior*, *lig. cruciatam atlantis*

5. चतुर्दशास्त्रां सङ्काताः । तेषां वयो गुल्फजानुवड्येषु । एतेनेतरस्यकथिवाऽप्य व्याख्याती । विक्षिरसीरेकैवः ॥१५

चतुर्दश शेष सामन्ताः । ते चास्थिसंघातवद्वर्णमीयाः, यतस्मैर्ज्ञा चस्थिसङ्काताः । वै इति काः सङ्कातास्तु खल्पटादर्थेकेवान् ॥१६

with *crus superius* and *inferius*), 4 in the spinal column (*lig. longitudinale anterius*, *lig. longitudinale posterius*, *lig. flarum*, and *lig. supraspinale*). The terminals of the 'kandaras' of the hand and feet are in the nails ; those of the neck passing through the heart terminate in the sexual organ (*medhra*) and those of the spinal column passing through the pelvis terminate in the pubis." *Susruta III. 5. 10.*<sup>5a</sup>

*Susruta*      Ligaments  
                  Tendons

### 1. The Extremities.

Toe	$5 \times 6 = 30$	$27 + 5 = 32$	Palmar band lig collateralia and synovial membrane at each interphalangeal joint, 2 in each toe and 1 in the large toe ( $2 \times 4 + 1 = 9$ ) and 5 dorsal extensor tendons.
Ankle } Heel }	30		5 Four ligaments and one synovial membrane
Sole }	28	18	5 Five tendons. intratarsal ligg. and 10 s. membrane.
Leg	30	28	
Thigh	40	34	
Hip-joint	10	$8 + 1 = 9$	
Knee-joint	10	$7 + 3 = 10$	
<hr/>			$150 \times 4 = 600$

5a. शोक्षण कस्तराः ; तासां चतुरः पादयोसावद्यो हस्तयोवाप्तेषु । तत्र हस्तपाद-जटानां कस्तराणां गखाः प्रोक्षाः । शोक्षणहस्तनिवन्धीनामधोभागगतानां मैट्रम् । शोक्षणहस्तनिवन्धीनामधोभागगतानां विलः । मूर्खोद्यष्टोऽस्मिक्षादीगात्र ॥१०

## II. The Trunk.

Loin.	60	18	
Back-bone	80	71	Lig. interspinalia, lig. supra-spinalia, lig. flava—vel subflava and synovial membrane for each of the 12 thora- cic and 5 lumbar verte- brae and 3 common liga- ments for all.
Sides (24 ribs)	60	72	Lig. capituli costae radiatum, lig. capituli costae interarticulare and syno- vial membrane for each of the 24 costo-vertebral articulations.
	30	56	Lig. costo-sternalium radiatum, lig. costo- xiphoidea, lig. sterno- costalia interarticularia and the posterior costo- sternal ligament for each of the 14 ribs ( <i>7 pairs</i> )

## III. The Neck and the Head.

Neck	36	52	4 Ligaments for each of the 7 cervical vertebrae, sterno-clavicular 12 and acromo-clavicular ligaments 12.
Head	34	31	Occipito-atloid joints 2 and each is provided with 8 ligaments, membrana atlanto occipitalis anterior, membrana occipitalis posterior, membrana tectoria, lig. cruciatum atlantis, lig. alaria, lig. apicis dentis, capsular ligament and synovial membrane ; atlo-axoid joints are three, each supplied with 5 ligaments, lig. transversum atlantis, capsular, anterior and posterior atlo-axoid ligaments and synovial membrane.
Total	900°	70	<i>Susruta III. 5, 30—32°</i>

६. नव व्यायुशतानि । तासां शाखाम् षट् शतानि । हे शते विंशत्ति कोहे ।  
यद्यां प्रत्युम् सप्ततिः ॥२०

एकैकस्यानु पादाङ्गुल्यां षट् लिचितासालिं शत् । तावत्य एव तलज्ञूर्भगुणकेषु ।  
तावत्य एव जङ्घायाम् । ददृ जानुनि । चत्वारिंशद्वृती । ददृ वडवये । शम्भक-  
बैदेवमिकस्थिन् सकथनि भवन्ति । एतेनेतरसक्यिवाहू च व्याख्याती ॥२१  
षट्ठिः कव्याम् । अश्वीतिः पृष्ठे । पार्श्वयोः षट्ठिः । उरसि विंशत् ॥२२

It will be noticed that there is a marked discrepancy between the two figures. And it may be due to the different methods of calculation and classification, or it is possible that by 'snāyu,' Charaka and Suśruta meant something entirely different from the ligament and the tendon. The general tendency of the Sanskrit scholars is to regard 'snāyu' as nerve. But this is contradicted by its etymological derivation from 'snā' or 'si', to bind and the Suśruta mentions 210 joints, but does not say anything anywhere else of the binding material that holds them together excepting of 14 'śimanta' at the junction of more than two bones (*samghūta*). He could not possibly omit to mention the binding material of the rest of the joints, when he has been minute in every other detail. And moreover the internal evidence tends to prove that he meant by 'snāyu', ligaments and tendons as he says :—“*Snāyus* are of four kinds—branching (*pratānavati*), globular (*ortta*), extensive (*prthu*) and perforated (*śuṣira*.) The ‘*snāyus*’ in the four branches and joints are branching ; ‘*kandaras*’ (the large *snāyus*) are globular; the ‘*snāyus*’ of the anterior parts of the stomach, intestine and the bladder are perforated ; the ‘*snāyus*’ of the sides, breast, back-bone and the head are extensive.

"As a boat of wooden planks well tied by many knots, can bear the weight of animals and goods in water, so a man can carry weight as his joints are knotted together by 'snāyus'. The body does not suffer as much by the destruction of the bones, muscles or joints as by the destruction of 'snāyus'. The physician that knows well the internal and superficial 'snāyus' can only extract from the body, the deeply impregnated missiles". "Suśruta III. 5. 34-36."

"The flesh (of the body) being tied to the bones by vascular system and 'snāyus', do not tear out and fall down". Suśruta III. 5. 22."

7. बायुस्तुर्भिंधा विद्यात् तासु द्वर्जा निवोध मे ।

प्रतानवयो हृतास्य पृथ्वयस्य शुष्पिराक्षया ॥१४

प्रतानवयः शाखासु सर्वेसन्धिषु चाप्यथ ।

डत्तासु कर्क्कराः सर्वा विद्येयाः कुशलैरिह ॥

आमपकाशयाग्नेषु वक्ती च शुष्पिराः खसु ।

पार्वर्णसि तथा इष्टे पृथुलास्य शिरस्य ॥१५

नीयं या फलकाक्षीर्णा वन्धनैऽनुभिर्युता ।

भारच्छमा भवेदप्सु दयुक्ता सुसमाहिता ॥

एवमेव शरौर्डिस्मिन् यावत्तः सम्यदः स्वताः ।

ज्ञायुभिर्द्वयासेन भारसहा नराः ॥

न श्वस्थीनि न वा पेय्यी न शिरा न च सम्यः ।

व्यापादिताक्षया इन्द्र्यं या जायुः शरौरिणम् ॥

यः जायुः प्रविजानाति वाच्चासाभ्यन्तराक्षया ।

स गूढः श्वस्यमाहर्तुं देहाङ्गक्लीति देहिनाम् ॥१६

8. मांसान्वय निवाहानि विरामिः ज्ञायुभिक्षया ।

अस्यीन्यालग्नेन लाता न शौर्यन्ते पदन्ति वा ॥१७

## IV.—The Vascular System.

The *vascular system* (*Sira* = tubular vessel) is no less difficult, rather more so, as it defies all human ingenuity to describe it in tabulated figures. For the arteries bifurcate into branches and twigs, and spread out all over the body in infinite shape and size ; the veins commence at the terminations of the capillaries and as they converge towards the heart, they form larger and still larger vessels, uniting with one another until finally seven large trunks empty their contents into the auricles of the heart ; likewise the lymphatic and the nervous networks. Hardly two vessels are of equal length, size, shape and dimension in two different parts of the body. Therefore any comparison is necessarily to be more or less of guess-work. In the following table only the large and distinctive longitudinal vessels have been counted from the '*Atlas of Applied Topographical Anatomy*' of Karl von Bardeleben and Heinrich Haeckel and the '*Regional Anatomy*' of George Mc Clellan. It seems that Suśruta includes the nervous net-work in the vascular system which he divides into four classes, nervous (*Vāta*—air), venous (*pitta-bile*), lymphatic (*kapha-phlegm*) and arterial (*raktavaha-sira*—blood-carrying vessel). The identification of the

*'vāta, pitta, kapha and raktavahā siras'* with the nervous, venous, lymphatic and arterial systems is not far-fetched and fanciful. For Suśruta says :—“The *vāta*-carrying vessels are of tawny or light-golden-brown (*aruna*) colour, and are filled with air; *pitta*-carrying vessels are all warm and of blue (*nīla*) colour; *kapha* bearing vessels are cool and of white (*sveta*) colour; the blood-carrying vessels are of red (*lohita*) colour and are neither warm nor cold.” III. 7. 13<sup>a</sup>.

“There are seven hundred tubular vessels : as gardens by water-conduits and fields by canals are irrigated and nourished, so by the irrigating and draining action of the *siras*, the body is nourished and sustained. As the midrib of a plant-leaf gives off laterally countless veins, so from the main (*siras*) small and smaller branches spread out.” Suśruta III. 7. 2<sup>b</sup>.

8a. तदाहृष्टा वातवहा: पूर्थम् वायुना शिरः ।  
पितादुचाच नीलाच श्रीता गौर्यः शिरः वकात् ।  
अथगृवहृष्टा रोहिष्यः शिरा नात्युच्चीतलाः ॥ ११

9. सम शिराश्तानि भवति ; याभिरिदं शरीरमाराम इव जलहारिष्येभिः केदार  
इव च कुल्याभिरुपजिञ्चतेऽमुरद्वाते आकुञ्जनप्रसारचादिभिर्द्वयेः । इदुभूपद्वसिक्षी-  
नामिद च तासां प्रताणाः । तासां नाभिमूळं, तत्य प्रसारम्बूँमध्यिर्यक् च ॥२

Substrata	Nerve-trunks	Veins	Arteries	Lymph vessels	Lymph.
<b>I. The Four Branches</b>					
Foot (Lower extremity)	25	30	22	19	16
Arm (Upper extremity)	25	26	33	21	23
Pelvic region	8	7	8	10	12
Sides	2p	9p	9p	9p	* (p = pair)
Back-bone	6	17	7	10	19
Breast	10	15	6	7	12
Stomach	6	9	6	7	11
Neck	14	15	14	15	16
Ear	2p	2	1	1	Nerves : ramus vestibularis and
Nose	6	7	6	5	3 cochlearis ; auditory artery dividing into 3 branches ; internal
Tongue	9	5	4	5	auditory vein.
Eye	4p	4	5	5	Nerves : frontal, oculo-motor, optic, trochlear ; Vena vorticosa, retinal, conjunctival, choroid and ciliary ; arteries : arteria centralis retinae, suprascleral, choroid & conjunctival.

"The nervous (*vāta*), the venous (*pitta*), lymphatic (*kapha*) vessels are 175 each as well as the arterial (blood-carrying *sīras*) passing the liver and the spleen. Thus seven hundred 'sīras' spread out all over the body. In one foot, there are 25 nerve-vessels ; likewise in the other foot and each of the arms. There are 34 nerve-vessels in the trunk of the body : in the pelvic region 8, in the sides 2 each, in the back 6, and in the breast 10, above the shoulder, there are 45 : in the neck 14, in the two ears 4, in the tongue 9 and both the eyes 8. Thus 175 nerve-vessels are described. And this description also corresponds to that of the venous, lymphatic and the arterial (blood-carrying) vessels, with this exception that instead of 8 nerve-vessels in the eyes and 4 in the ears, there are 10 (in the eyes) and 2 (in the ears) of the venous, lymphatic and blood-carrying (arterial) vessels."

*Sūsruta III. 5. 7. 5-7<sup>10</sup>.*

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10. तासां मूलशिराश्वत्वारिंश्ट—तासां वातवाहिन्यो दृश्य, पित्तवाहिन्यो दृश्य, कफवाहिन्यो दृश्य, दृश्य रक्तवाहिन्यः । तासान्तु वातवाहिनीना वातस्थानगताना पञ्चसप्ततिशतं भवात्, वातव्य एव पित्तवाहिन्यः पत्तस्थाने, कफवाहिन्यश्च कफस्थाने, रक्तवाहिन्यश्च यज्ञात्प्रीष्ठोः—एवमेतानि सप्त शिराश्वताणि ॥५॥

तत्र वातवाहिन्यः शिरा एकश्चिन् सक्षयि पञ्चविंशतिः । एतेजेतरस्त्रियादूच्च व्याख्यातौ । विश्ववत्सु कोषे चतुर्विंशतः ;—तासां गुदमिदृशिताः श्रोखामटी,

That the heart was the centre of the circulatory system, of the blood, was well understood by *Susruta* (1. 14. 3-6) and according to Charaka it has 10 out-going (*arterial*) and in-coming (*venous*) trunk-vessels (1. 30. 1).

"Though chyle [*rasa*] circulates all throughout the body, its principal centre is the heart (*hrdaya*). That chyle in 24 tubular vessels, 10 upwards, 10 downwards and 4 sideways, enters into every part of the body, irrigates and maintains its growth, vitalizes and supports life..... . Though chyle is aquatic in nature but in its passage through the liver and the spleen, it becomes blood. *Susruta* 1. 14. 3-5.<sup>11</sup>

६३ वे पार्षदोः, षट् षष्ठे, तावल्य एव चोदरे, दश वक्षसि । एकचत्वारिंशञ्जुष्ण  
जर्जः;—तासां चतुर्हेतु ग्रीवायां, कर्णयोथतसः; नव जिह्वायां, षट् नासिकायाम्,  
चट्टी नेकगोः । एवमेतत् पञ्चसप्तत्यधिकशतं वातवहानां शिराणां व्याख्यातम् ॥५

एव एव विभागः शिराणामपि । विशेषतसु पित्तवाहिन्यो नेत्रयोदयं, कर्णयोदयं ।  
एवं रक्तवहाः कफवहास । एवमेतानि सप्त शिराशतानि सविभागानि व्याख्यातानि ॥७

11. तस्य हृदयं स्थानं, स हृदयाच्चतुर्विंशतिं धमनीरग्नप्रविष्टोऽर्हंगा दश दश चाधी-  
गामिष्वस्तस्तस्तिर्थग्नाः लत्कं शरीरमहरहस्तपर्यति वर्जयति धारयति यापयति  
जीवयति चाहृष्टहितुकेन कर्मणा ॥९

तस्य शरीरमतुधावतोऽनुभानाङ्गतिरुपलक्षयितव्या ज्यहित्वैक्लैः । तथिन्  
सर्वश्वरोदावयवदीपधातुमलाश्यानुसारिणि रसे जिह्वासा, किमयं सीम्यक्षेत्रस इति ।  
अदोषते स खलु इवानुसारी ज्ञेहनग्रीयनतपर्यग्नारथादिभिरितैः सीम  
इत्यबग्न्यते ॥१०

"In the heart there are ten great out-going [*mahāmulā*] and in-coming [*mahāphalā*] tubular vessels [*dhamanī*]." Charaka 1. 30. 1<sup>1a</sup>. The ten great vessels are the seven main trunk veins and three arteries as follows: (1) superior vena cava, [2] interior vena cava, [3] coronary sinus, [4-7] vena pulmonalis ; [8] left pulmonary artery, [9] aorta, [10] right pulmonary artery.

"Below the heart, on the left side the liver and the lung, and on the right side, the spleen and the lung, are situated." Suśruta III. 4. 30<sup>12</sup>.

According to Chāraka the skin consists of six strata (IV. 7. 2)<sup>13</sup> but Suśruta more accurately describes them to be seven. III. 4. 3<sup>14</sup>.

11a. अर्थे दश सहामूलाः सिराः सक्ता महाफलाः ।  
महाशार्थं च हृदयं पर्यायैरुच्यते बुधेः ॥

12. शोणितकफप्रसादं हृदयं, यदायथा हि धमन्यः प्राणवहाः । तस्माथी  
बासतः श्रीहा फुस्कुसय, दक्षिणतो यक्त् लोम च ॥३०

13. सर्वं शरीरमभिसंचक्षाण्ट यथाप्रश्नेकमनाः । यथावच्छर्वं च षट् लच्छद-  
यथा—उदकधरा लग् वाक्षा, दितीया लयस्त्वधरा, दृतीया सिभ्मकिलाससञ्चवा-  
षिड्हाना, चतुर्थी कुड्डसञ्चवाषिड्हाना, पञ्चमी अलजीविदधीसञ्चवाषिड्हाना, षष्ठी तु  
सा यसां द्वितीया तात्पर्यम् इव, च तमः प्रविशति या चात्पिड्हायाद्विजायने  
पर्वं समिक्षु क्षणरक्तानि अूलमूलानि दुष्कितस्तमानि चेति, षट् लच्छ एताः  
षड्डः शरीरमवतत्य तिष्ठन्ति ।

14. तस्य हृले वंप्रहृतस्य शुक्रशोणितस्याभिपञ्चमानस्य चौरस्ये व समानिकाः सम  
त्वयो भवन्ति । तासां प्रथमावभासिनी नाम, या सर्वं वर्णानवभासयति गच्छ-  
विद्याच्च चायां प्रकाशयति । सा श्रीहेरादशभागप्रमाणा, सिभ्मपञ्चकष्टकाषिड्हाना  
दितीया शोषिता नाम, वोक्षभागप्रमाणा तिलकालकन्त्यच्छव्यग्राषिड्हाना । दृतीया

Sūrūta	Strata of the skin according to Modern anatomy
Avbhāsinī	Stratum corneum
Lohitā	Stratum intermedium}
Svetā	Stratum disjunctum } lucidum
Tāmrā	Stratum granulosum
Vedinī	Stratum mucosum
Rohinī	Stratum germinativum
Māṃsadharā	Corium

From the foregoing comparative charts, it will be seen, that though the ancient Hindu anatomical school erred in some details, but in fundamentals, their knowledge was remarkably accurate, minute and thorough, especially when we take into consideration the dim and distant age, in which these medical treatises were composed. The study of anatomy was regarded essential in the medical education and practice. Charaka says :—“In the medical science, knowledge of anatomy is necessary ; one can only understand principles of hygiene, when he has

चेता नाम, वादश्वागप्रमाणा चर्मदलाजगङ्गीमशकाधिष्ठाना । चतुर्थी ताका नामाद्भागप्रमाणा विविधकिलासकुडाधिष्ठाना । पञ्चमी चेदिनी नाम, ब्रौहिपद्म-भागप्रमाणा कुडविसपांधिष्ठाना । षष्ठी रोहिणी नाम, ब्रौहिप्रमाणा यन्त्रयपद्मच्छुद्धीपद्मगलगच्छाधिष्ठाना । सप्तमी मांसधरा नाम, ब्रौहिव्यप्रमाणा भगवन्दरविद्युध्य-ओऽधिष्ठाना । यदेतत् प्रमाणं निहिंदं तन्मांससेष्वकाश्चिपु ; न खलाटे सूक्ष्म-च्छुद्धादिपु । यतो वज्रालुदरेतु ब्रौहिसुखेणाहु ठोदरप्रमाणमवगाढ़' विशेदिति ॥१

studied bodily sciences (anatomy and physiology) IV. 6. 1<sup>5</sup>.

Suśruta recommends dissection. He says : "The parts and the parcels (of the body) that have been mentioned up to the skin, can not at all be described without dissection. So if a surgeon wants to acquire positive (doubtless) knowledge, he should analyse thoroughly all the parts and organs of a body, after disinfecting it. Ocular observation easily supplements studies and adds to knowledge. (The way a corpse should be taken for observation is described thus). The corpse should possess all the organs and not be deceased of any long illness or of poisoning, nor should it be of a man of a hundred years of age. The contents of its viscera (urine and feces) should be removed and it should be kept in a stream without current to rot. A platform should be made in the water to lay the corpse on it and cover the whole body with hay, grasses and leaves, so that fish can not eat it, and it is not put out of its place. In seven days, it will decompose sufficiently and then rub it gently from the skin to the interior with

15. शरीरविच्यथः शरीरोपकारार्थमिष्टते भिषग्निद्यायाम् । आत्मा हि शरीरतस्मै शरीरोपकारकरेत् भावेत् शान्तस्तपयते तजात् शरीरविच्यथं प्रशंसन्ति कुशलाः ।

grass, hair or bamboo-skin and observe minutely every organ and every part of the body.  
*Susruta*, III. 5. 49-50<sup>16</sup>.

In the Hippocratic collection of writings, though there is no systematic presentation of muscles, ligaments, blood-vessels and glands, yet their knowledge and position are clearly indicated in the books '*peri arthron*' (articulations) '*peri osteon physios*' (the nature of bones), '*peri odenon*' (glands), '*peri sarkon*' (flesh) and '*mochaiikos*'. However their description is very vague and meagre, as being mentioned indirectly in connection with the treatment for dislocation and fracture of bones.

Galen was undoubtedly, par excellence, the greatest of ancient anatomists. The manner

16.

त्वक् पर्यन्तास्य देहस्य योऽयमङ्गविनियथः ।

शल्याशानाहते नैष वर्णं तेऽङ्गे बु केवुचित् ॥

तस्माद्विसंशयं शानं इत्रां शल्यस्य वाञ्छता ।

शोधयित्वा भृतं सम्यग्द्रष्टव्योऽङ्गविनियथः ॥

प्रत्यच्चतो हि यद्दृष्टं शास्त्रदृष्टव्य यद्भवेत् ।

समाप्ततस्तुभयं भूयो शानविवर्जनम् ॥४८

तस्मात् सुमस्तगावावविषोपहतमदीर्घत्याधिपीडितमवर्षशतिकं निःस्वान्वपुरीष-  
पुरुषमवहन्यामापगायां निवर्णं पञ्चरस्यं सुञ्चवस्त्वलकुशशणादीनामन्यतमेनावेदिताहास-  
प्रकाशे देशे कोथर्यत् । सम्यक् प्रकृयितस्त्रीहृत्य ततो देहं समरावादुभयोरवासवेष्य  
वस्त्रालकृचीनामन्यतमेन शनैः शनैरवर्षयं स्वलगादेन् सर्वांनेव वाञ्छाभ्यन्तराङ्गप्रत्यय-  
विशेषान् यथोक्तान् लक्षयेद्यत्तु वा ॥५०

and methods of his narration, the style of his language, the accuracy of his description, make the anatomical study, not only instructive, but captivating and refreshing. He divides his monumental work, "*The Utilities of the Human Body*" which became the classic and the standard authority in human anatomy in Europe and the Saracen empire for more than fourteen centuries, into 17 books or chapters as follows:

—I. Hand ; II. Hand, fore-arm and the arm ; III. Abdomen ; IV. Alimentary organs and their auxiliaries ; V. Alimentary organs and their auxiliaries ; VI. Respiratory organs ; VII. Vocal organs ; VIII. The head, brain and the senses ; IX. The cranium, the brain and the cranial nerves ; X. The eyes and their auxiliaries ; XI. The face, especially the jaw-bones ; XII. The neck and the rest of the spine ; XIII. The pelvic structure ; XIV. Genital organs ; XV. Genital organs ; XVI. Nerves, arteries and veins ; XVII. Epilogue—Difference between function and utility. On every organ and every part of the body, Galen gives a comparative review of the similar structure of other animals and philosophic generalisations as to the origin and development of organs, which he ascribes to functional utility and

adaptation as a means of self-preservation and reproduction and thereby anticipating Lamarck (1744-1829) by nearly seventeen centuries. Below is given a short translation of his introductory general remarks on the 'genital organs', as a sample, believing that it will interest more readers than any other part of the body.

"Nature has three objects in view in the structural formation of the animal; she has created them really, either for preservation of life as the brain, heart and the liver, or for the convenience of life as the eyes, ears, nose and hands, or for the perpetuation of the race as the external genital parts as the testicles and the matrix; now we have previously demonstrated in detail, that any of the parts, either created for (preservation of) life, or for its embellishment, could not be better devised than what they are actually. It still remains for us to explain in this book, the parts, destined for the perpetuation of race among us.

"First of all, nature would have desired, if it were possible, to create her work immortal. Nature not permitting it, she has invented the expedient she could to obtain immortality for it (her creation), as a clever founder of a city, who not only cares that his city is actually

peopled, but takes all precautions that it lasts for ever, at least as long as possible. However it does not appear that any city has been fortunate on that point, to have lasted so long that time has completely effaced the memory of its founder. But works of nature have lasted for thousands of years and shall live still, by the admirable means, she has invented to substitute always a new animal for a dead animal.

"What is then the means adopted among animals and man, so that no race perishes, on the contrary each race remains intact and immortal ? That is what I propose to explain in this book, in commencing with my exposition. Nature has given to all animals organs of conception and she has associated with those organs a special impulse of pleasure of generation and filled the soul with such an irrepressible desire, quite unexplainable with their functional uses, that the animals erotically excited and impassioned, especially the adolescent, though deprived of reason and understanding, attend to the perpetuation of the race, as if they were completely reasonable. One should think that nature really knowing that the objects she has created, being not susceptible of perfect wisdom, has given the

animals, as a substitute for that wisdom, the allurement of intense pleasure, associated with the usage of those organs to assure the salvation and conservation of the race.

"It is just to admire, first, the ingenious device of nature and then the structure of the organs which naturally correspond for each animal to its bodily form. You would learn from us one day, concerning other animals when we fill the gap, left by Aristotle. For the human species, all the world knows and understands, to what degree of utility, the external genitals by their convenient situation, their dimension, their figure and their entire conformation, have attained. When you will know the utility of each organ, profoundly hidden, organs which are revealed by dissection, you will admire, I am sure, the art that has created them.

"In fact, nature has placed the matrix beneath the stomach, the region she has recognized as the most favourable for copulation, reception of the sperm and especially for the growth of the embryo so that the fetus can attain to a perfect state. You could not find, in fact, in any part of the animal, another region more suitable, for any of the purposes above-mentioned ; this is the best (place)for copulation, being far removed

from the facial organs ; most favourable for the growth of the fetus, being capable of considerable distension without difficulty and finally, the most convenient for the child-birth, as it is the easiest for the baby to slip off downwards to the inferior parts and the legs. In fact, the mouth of the matrix, which nature has formed as a passage for the entrance of the sperm and the departure of the embryo when it has reached its complete development, opens in the vagina. When the animal has conceived, the mouth (of the matrix) closes so firmly, it will not permit the least thing either to escape or to penetrate ; during copulation, it dilates and extends in such a way that the sperm has an easy and large passage to the matrix."

## II. PHYSIOLOGY

‘‘*Anna*’ (food) supplies the body with ‘*dhātu*’ (elements) for its up-building and preservation.” *Sūruta* 1. 14. 11<sup>17</sup>. Food is converted in the alimentary tract into ‘*rasa*’ (chyle) by ‘*antaragni*’ (internal fire or combustion, that is oxidation). Oxidation takes place by the natural warmth of the ‘*pitta*’ (bile=sanguinary principle) of the body. “As fire in a hearth converts rice and water of a cooking pot into food and foam, so the digestive-fire (*pachatyagni*) converts the ingested food and drink into chyle and ‘*mala*’ (excreta=feces and urine).” *Charaka* VI. 15. 6<sup>18</sup>. The bile-duct being situated above the alimentary receptacle, digestion is facilitated by the favourable situation as that of the sun and the moon. (The idea being that as cooking easily takes place when the cooking-pot is placed upon the fire and not below it or sideways, so the stomach being situated above the bile-duct, which was regarded as the fire-principle, easy

17. चक्रात् पाणाव मतिमानायाराचायतन्दितः ।  
तव रस गती चातुरहरहर्गच्छतीत्यतो रसः ॥११  
18. एवं रक्षमानायारामायस्यस्यमधःस्थितः ।  
पश्यप्रियं चा स्वात्मानोदगावाणु तस्युलम् ॥

digestion was the natural consequence). Due to the rich aquatic content of the place, ingested food and drink are easily softened, favouring digestion. *Susruta* 1. 21. 16.<sup>19</sup>

"Now the question is whether the (digestive) fire is a different thing from 'pitta' (the bile) or the bile is the fire ? The answer is that due to its caloric quality, 'pitta' acts as fire in its action of cooking (*pachana*) and oxidation (*dahana*); and therefore, the bile is called the 'internal fire' (*oxidase*). *Susruta* 1. 21. 9<sup>20</sup>.

"The chyle (*rasa*) though aquatic, becomes red during its passage through the liver and the spleen. In the radiant heat of the body, the qualified chyle becomes red, and is called the 'rakta' (blood)." *Susruta* 1. 14. 5-6.<sup>21</sup>

19. शेषस्थानात्यत जड़ें वचामः । तदामाशयः पित्ताशवस्त्रोपरिष्टात् तत्-  
प्रत्यनीकाशवाद्युर्गतिव्यात् तेजसश्च इवादित्यसः । स चतुर्विधस्याहारास्याधारः । स च  
तदीदकैर्गुण्यं राहारः प्रक्षिप्तो भिन्नसङ्कातः सुखजरो भवति ॥१६

20. तद विज्ञासः, किं पित्तव्यतिरेकाहृष्टोऽपि:, आहोस्ति पित्तमेवाचिः  
इति । चतोर्थते, — न खलु पित्तव्यतिरेकाहृष्टोऽपि वद्यत्वात्, आपेयत्वात् पित्ते  
दहनपचनादिष्वभिवर्तमानेऽप्तिवदुपचारः क्रियतेऽन्तरप्रिविति । शौचे श्चपिण्डि  
त्वासमानद्रव्योपयोगादतिप्रवृद्धे शोत्रक्रियोपयोगादगमात् पश्चामो न खलु पित्तव्यति-  
रेकाहृष्टोऽप्रिविति ॥८

21. स खलायां रसो यक्तव्येहानी प्राप्य दागसुपैति ॥५  
भवतश्चात्

रज्जिताक्षेजसा रथापः शरीरस्येन देहिनाम् ।  
अव्यापद्माः प्रसद्वे न रक्तमित्यभिवीयते ॥६

"Chyle is transformed into blood, blood into flesh, flesh into fat, fat into bone, bone into marrow and marrow into semen." *Susruta* 1. 14. 10.<sup>22</sup>

"Because the chyle is transformed into 'dhātu' (elements or bodily substances), and it constantly circulates in the body, it is called the 'rusa'.

"This 'rasa' remains in each 'dhātu' 3500 moments (that is, the chyle is formed the same day, but it takes five days for the chyle to be transformed into blood and blood into flesh etc.) and thus in one month it is converted into the semen of man and 'ārttava' (the rupture of the Graafian vesicles with the ripeness of the ova, or the menstrual blood which is associated with the occurrence) of woman." *Susruta* 1. 14.11-12<sup>23</sup>.

Semen "circulates in every part of the body of all living beings ; as fat in the milk, sugar in the sugar-cane juice, so is the semen (*sukra*)

... रसाद्वकं ततो मांसं मांसान्धेदः प्रजायते ।

मेदसौरस्थि ततो मन्त्रा मन्त्रः शुक्रसं सम्बद्धः ॥१०

23. तद रस गती धातुरहरहर्गच्छतीत्यतो रसः ॥११

स खलु वौषिं वौषिं कलासहस्राणि पश्चदय च कला एकेकालिन् धाताववतिष्ठते ।  
एवं नासेन रसः शुक्रोभवति स्त्रीषामार्तवलिति ॥१२

present in the human body." *Susruta* III. 4. 20-21<sup>4</sup>. It is not manifest in the children for it is present in a small quantity as the sweet aroma and delicate fragrance of a flower is not perceived in a young bud before time develops and ripens it, though its presence can not be doubted in an elementary state. *Susruta* I. 14. 15<sup>4a</sup>.

"In the living body, there are as many circulations as are present in the body like the chyle and the blood etc. for in the living body without circulation, they can not be produced or reduced." *Charaka* III. 5. 1<sup>4b</sup>.

"The centre of the vitalizing (*prāṇavaha*) circulation is the heart and the great trunks (*mahā-srota*) of arteries and veins). *Charaka* III. 5. 3<sup>4c</sup>.

24. सप्तमी शुक्रधरा नाम, या सर्वप्राणिनां सर्वशरौरव्यापिनी ॥२०

भवति चाद

यथा पथसि सर्विस्तु गुणेभ्यो रसे यथा ।

शरीरेषु तथा युक्तं चक्रं विद्याद्भिषगृः ॥२१

24(a). यथा हि पुष्टसुकुलस्यो गन्धो न शक्वनिष्ठासीति वस्तुं नैव नाशीत्यवासि, सतां आवानामभिव्यक्तिरिति इत्यु केवलं सीच्छानामभिव्यव्यति स एव गन्धो विडतपवक्तिर्य तु सुमि कालान्वरेणाभिव्यक्तिं गच्छति ; एवं चालानामपि वयःपरिष्यामात् शुक्रस्य प्रादुर्भावो भवति । रोमराज्यादयोऽधार्थवादयस्य विशेषा नारीणां रजसि चोपचौय- नामि शब्दः इहैः शब्दः लालगर्भाशयद्योषभिव्यक्तिर्भवति ॥१५

25. यावत्क्षः पुरुषे मूर्त्तिभूमिभावाद्य एवाचिन् खोतसां प्रकार- विशेषाः । सर्वे भावा हि पुरुषे नामरेष खोतास्यभिव्यक्त्यन्ते वायर्थ- गच्छति ।

26. तद्र प्राणवहाणां खोतसां इदयः सूलं महाखोतसः ।

"As the fibres of the water-lily and lotus stalks are naturally perforated, so in the tubular vessels, there are minute pores in the tubular vessels (*dhamani*) through which the 'rasa' circulates." *Suśruta IV. 9. 9;*

### I. Digestion.

From the above quotations, it can be seen that the ancient Hindu school of medicine grasped the essential fundamentals of digestion and circulation, though the intricate and complex process of their mechanism was not and could not be understood by them. Physiological chemistry is of but very recent development and growth. A few years ago, it was not even suspected that the digestion and absorption were due to the fermentative action of the glandular secretions. The digestive ferments or enzymes reduce the ingested food particles by cleavage into their elemental compounds by creating molecular instability through their electro-chemical action and in proportion as the food-stuffs are altered thus in the alimentary canal and transformed from insoluble into soluble substances, from such as are not diffusible into such

as are easily diffused, and they are absorbed by the epithelium of the gastro-intestinal mucous membrane and are synthetized into chyle during the passage through the restitutive secretion of the cells. The reaction of the enzymic activity upon the ingested food-particles, is the reduction and cleavage into their component elements, which is the same thing as oxidation. The Hindus understood that digestion was con-committant with oxidation (*antaragni*), but did not know that the oxidation was caused by the digestive ferments.

'*Rasa*' has been translated as the chyle, for it is the most appropriate available term. But '*rasa*' is more than chyle. '*Rasa*' is the whole of the soluble and diffusible solution of the digested food which being partially regenerated and synthetized during its passage through the mucous membrane by the anabolic restitutive secretions of the living cells, either enters into the lymph sinuses of the mucosa, or are absorbed by the solitary and agminated follicles and by the lymph-glands interposed along the lacteals or are taken up by the blood capillaries of the mucous coat, especially in the villi of the small intestine. Whether the '*rasa*' forced into the lymph torrent is carried along the thoracic duct

which pours its contents (lymph and chyle) into the left subclavian vein or absorbed in the blood capillaries of the villi, travel by the venous portal system, it has to pass through the hepatic cells for further synthetic transformation, before it is driven to the heart for general circulation.

The blood is red in color, for it is caused by the mass of red-corpuscles (*erythrocytes*) held in suspension in the plasma. The blood is composed of a liquid part, the 'plasma', in which float a vast number of microscopical bodies, the red corpuscles (*erythrocytes*), the white corpuscles (*leucocytes*) and the blood plates or platelets (*hematoblast*). The red corpuscle has the shape of a biconcave disk with bevelled edges with a diameter of 0.0075 millimeter in man and for each cubic millimeter of blood, there are red corpuscles in man from 4 to 5 millions, in goat 9 to 10 millions, in sheep 13 to 14 millions, in birds 1 to 4 millions and in fish quarter million to two millions. The chief function of the red corpuscle is to carry oxygen, which it owes to its principal ingredient—haemoglobin and which possesses the special quality of chemically combining with oxygen and yielding up the same oxygen, whenever there is decrease in the concentration of oxygen in the solvent. In perfor-

mance of this important function, the red corpuscles soon lose their vitality, deteriorate and are disintegrated in the liver. The liver eliminates the wastes and the pigments as an excretory product, which thus receives the golden brownish tinge. The bile is essentially the excretory product of the metabolic wastes which are formed in the hepatic cells as a result of their detoxicating and metabolic activities, but the bile has adapted in the economy of the system, to the functional utility of zymo-excitors, particularly of the lipolytic enzymes. The red corpuscles are newly formed again in the red bone marrow and the spleen, where special cells are provided for their reproduction. But it is probable that the spleen plays a more important role in the integration and synthesis of the haemoglobin molecules, for iron is its important component element, having special chemical affinity for oxygen, and iron is principally metabolized in the spleen.

It is therefore a delightful surprise to read in Charaka and Suśruta that they attributed to the liver and the spleen of transforming '*rasa*' into blood, and heart was the centre and medium of the blood circulation to irrigate, feed, nourish and sustain tissues and life. Of course it was a fanciful speculation that the blood is trans-

formed in five days into flesh and in a month into semen. But the blood supplies the nutrient materials for the cellular sustenance, growth and upbuilding. And it is a fact, though 'spermin', the special substance of the semen, is found in concentrated form in the testes and prostate, it is found in a considerable quantity in the thymus, milt, ovaries and the blood and plays an important role in the general oxidation of the tissues and in the metabolic reduction of the intermediate regressive albuminous substances as leucomines into harmless products as urea. \*

'Rasa' contributes to health, pleasant countenance and nourishes the blood ; the blood contributes to the brightness of the skin, nourishment of the flesh and keeps one alive ; fat contributes to the adipose tissues, perspiration, hardihood and health of the bone ; the bone keeps the bodily frame and nourishes the bone-marrow ; the bone-marrow contributes to the pleasant countenance, adipose tissues, strength (of the body), increase of the semen and fills the bone ; the semen contributes to the personal bravery, resistance to disease (*chyavana*),

\* (A. Poehl : *Einwirkung des Spermias auf den Staffunsatz.* Zütt für klin. Med.. 1894, p. 135)

inclination to pleasure, physical strength and reproductive power. *Susruta* I. 15. 6<sup>o</sup>.

“‘*Slesma*’ (lymph) is produced in the intestine, sweet and cool ; from the sweetness, viscosity, and humidity from the digested food.” *Susruta* I. 21. 17<sup>o</sup>.

“‘*Slesma*’ is white (chyle in the lacteal, especially after the heavy ingestion of fat), heavy and cool ; when it is unoxidized (*avidagdha* in the lacteal and in the thoracic duct, still in the condition of chyle), it is sweet, but when oxidized, it is alkaline.” *Susruta* I. 21. 19<sup>o</sup>.

*Slesma* “lubricates joints (*snovia*), is fattening, healing, flesh-giving, causes growth, refreshing through moistening, strengthening, adds to the thickness of the subcutaneous fat, and thus ‘*slesma*’ doing five functions according to the position, benefits the body.” *Susruta* I. 15. 5<sup>o</sup>.

28. रक्तसुटि ग्रीवनं रक्तपुष्टिच करोति । रक्तं वच्च प्रसादं मांसपुष्टि जीवयति च । नांसं शरीरपुष्टि मेहसच । मेदः के हसेदी डक्कवं पुष्टिमस्याच । अस्ति देहारचं नदः पुष्टिच । मज्जा ग्रीविं के है वलं यज्ञपुष्टि पूरणमस्याच करोति । शुक्रं वैर्यं अवलं ग्रीविं देहवलं इर्थग्रीवार्यच ॥४

29. माधुर्यात् पित्तिकलाच प्रस्त्रे दिलात् तर्पय च ।

आमार्यी सप्तवति ग्नेत्राना मनुरवीतवः ॥१७

30. ग्नेत्रा चेतो गुहः मित्रः पित्तिकः शीत एव च ।

नपुरुषिदवधः स्नाविदशो लवणः कृतः ॥१८

31. रक्षितं ग्नेत्रालोकनोपचरणं इष्टतपं वचलस्त्वैर्यं लत् ग्नेत्रा पञ्चाणा प्रविभास उद्दक्षकर्त्त्वामुपयः करोति ॥५

That by 'slesma' or 'kapha,' lymph was understood, is proven by the fact that Suśruta describes in the vascular system (III. 7. 1-13) the tubular lymph-vessels with arteries, veins and nerves and that his 'slesma' corresponds to the synovial lymph, is corroborated by this passage :—"As it works well, if oil or fat is applied to the axle of a carriage wheel, so the 'slesma' acts in the joints of the living beings." III. 4. 15<sup>2</sup>.

## II. Circulation

The lymph is a colorless liquid found in the lymph vessels as well as the extravascular parts of the body, having almost the same constituents as the blood-plasma. The lymph is at least in part the mediator in the exchange of constituents between the blood and the tissues. Throughout the entire body, there is a rich supply of blood vessels penetrating every tissue with the exception of the epidermis and epidermal structures as the nails and hair. In the ground-work of the tissue, there is space and this interstitial space is filled with lymph and thus all the tissue elements, in fact, may be regarded as being bathed

32. लेहाभ्यन्ते यथा तुच्छे चक्रं साधु प्रवर्तते ।

सम्बद्धः साधु वर्तन्ते च शिराः लेहाभ्या तथा ॥१५॥

in lymph. From this fluid the cell takes the necessary nutrients dissolved in it, and into it the cell discharges its waste products. In the interstitial space, the lymph freely intercommunicates, finally connecting with a number of fine tubes—the lymphatics, through which excess of fluid, tissue wastes, pathogenic germs and their products are drained off. The lymphatics like the blood-vessels freely anastomose, thus forming large trunks which finally empty their contents in the main venous trunks at both the junctions of the jugular and subclavian veins. In the course of the lymphatics, there are numerous adenoid structures (lymph-glands) which act as a filter as the fluid passes through them, retaining all the pathogenic germs, their deleterious products as well as various excretory products, which the lymph-glands either destroy or make them comparatively harmless.

The flow of the blood-plasma into interstitial space, where it is known as the lymph, is governed by the principles of pressure, filtration, diffusion, osmosis and the relative permeability of the capillary walls. The intracapillary pressure tends to filter the plasma through the endothelial cells composing the walls of the capillaries ; the force of diffusion arises from

the inequality of the chemical composition of the blood-plasma and the interstitial fluid; osmosis from different molecular concentration and relative permeability according to the regional capillary structure.

Though lymph lacks any central heart system as the blood vessels, the flow of its circulation is perhaps regulated by the relative pressure-level from the higher tension in the capillaries to lower in the lymphatic space and in the minute vessels considerably much greater than in the larger ones as in the veins, and as this difference of pressure is the cause of the flow of venous blood from the capillaries to the heart. This flow may be accelerated by other factors. The lymphatics are provided with muscular wall of automatically oscillating tonus under the influence of special vascular nerves and as with each systolic efflux, there is an increased pressure of the arterial flow, muscular and nervous dilation which make the perivascular lymphatic valves act like tiny pumps, accentuating the momentum of the centripetal evacuation of the contents. Perhaps inspiration also exerts a sucking action by positively lowering the pressure at the sub-clavian vein in which the thoracic duct empties its contents.

The lymph fluid is not uniform in composition in every part of the body. The lymph originates from three sources : (a) by filtering from the blood through the capillary wall ; (b) from exudation of the tissues with their anabolic and catabolic wastes ; (c) the digested nutrient solution which is absorbed by the lymphatic roots of the intestinal villi and which is known as the chyle.

The composition of the lymph, therefore, is variable. In the lacteals, the lymph mixed with the chyle has often after the ingestion of heavy fat and protein, a milky white appearance and contains a good deal of sugar. The lymph which flows from the fistula of the thoracic duct, is a watery, slightly opalescent fluid. In the capillary lymph-space and in the large serous cavities as the peritoneum, pleura, pericardium, tunica vaginalis of testicles, where there is always a sufficient quantity of the lymph to keep the walls lubricated and moistened, it is a colorless liquid, almost like water, but decidedly alkaline.

The lymph does not coagulate as easily as the blood. But it contains fibronogen and in case there is any rupture of the lymphatic, it readily clots so that no serious damage be done

to the tissues. But unlike the blood, the lymph contains a very few corpuscles. Platelets and functions (*thrombocytes*) are always absent; the red-corpuscles (*erythrocytes*) are met with on very rare occasions; but the *leucocytes*—the wandering cells, are always found, though smaller in size and fewer in number. Perhaps the leucocyte through its ameboid movement traverses through the capillary membrane and enters into the lymph-stream and acts as useful scavenger and devourer of any pathogenic germ that might have gained access in the tissues; or the leucocyte may be produced in the lymphatic glands and enter into the arterial circulation when the lymph trunks empty their contents at the junctions of the jugular and subclavian veins and are carried to the heart. In the blood the leucocytes are seen larger and with developed phagocytic power for the reason that the blood contains opsonin and alexin which sensitize the pathogenic micro-organisms, thus facilitating phagocytosis. The destroyed germs are dissolved in the blood, increasing thus the protein content, which is a nourishing food to the leucocytes.

So lymph glands not only filter and purify the lymph stream, they are ever watchful sentinels to catch and retain any dangerous marauder

that may be in the lymph torrent, but also are active synthetic laboratories for the origin and development of the leucocytes. In this vital work with the lymph-glands in the lymphatics, all the lymphoid adenoid bodies as the spleen, bone-marrow and the thymus have their important share. In malarial fever, it is a well known fact that the spleen is enlarged. This only means that the spleen is hyperactive, destroying the minute protozoa that are attacking the red-blood corpuscles and producing an excessive number of leucocytes for the bodily defence. This also explains that with the ablation or total extirpation of the spleen, there is no serious consequence or there is any marked reduction of the leucocytes in the blood. The task of the spleen is supplemented and functioned by the bone-marrow and the numerous lymph-glands which are numerous and are scattered either single or in cluster all throughout the lymphatics.

On the whole the flow of the lymph is very sluggish and much slower not only than the arterial, but also than the venous blood.

Susruta also mentions twenty-four 'dhamani' and passage of some other liquids in the body. But he does not confound 'dhamani'

with 'sira' (vascular system) like Charaka (I. 30. 10). He says : "There are some who say that *dhamani* and *srota* are not different from the *sira* (vascular system). But this is not just ; *dhamani* and *srota* are different from the 'sira'. For the characteristics of the '*srota*' and '*dhamani*', differ from those of '*sira*'. How ? For the '*siras*' have main central trunks and their action is also otherwise. In the medical science, they are mentioned separately. Only because they are situated close to each other, they are minute and there is some similarity in their action, therefore in spite of their dissimilar activities, they are often confounded with each other. *Susruta* III. 9. 2<sup>33</sup>.

"There are two vital streams—*srota* : their main bearers (*mūlasthāna*) are the heart and chyle-carrying tubes (lacteals and thoracic duct); if they are penetrated (by any wound), involuntary cries, syncope, hallucination, illusion and trembling appear and death might even take

33. अतुर्जिंश्चिर्धन्यो नाभिप्रभवा अभिहिताः । तत् कैचिदाहुः शिराधमनौ-  
स्रोतसामविभागः, शिराविकारा एव धमन्यः स्रोतासि चेति । तत् तु न सम्यक् ।  
अवधा एव हि धमन्यः स्रोतासि च शिराभ्यः । कस्यात् ? व्यञ्जनान्यतृष्ण्युलसप्रियमात  
कर्ष्णैश्चेष्टादागमात् । कैवल्यं परस्परसप्रिकर्ष्णत् सदृशगमकर्ष्णतात् सीख्याह  
विभक्तकर्ष्णामयविभाग इव कर्ष्णसु भवति ॥२

place. Alimentary canals are two and their bearers are the intestine and the lacteals : if they are penetrated, pain, loss of appetite, vomiting, thirst, blindness or immediate death take place. Serous (*udaka*) tubes are two and their bearers are '*tālu*' (between the meningeal membranes surrounding the central nervous system) and the '*kloma*' (*pleura*) ; if they are penetrated, thirst and immediate death take place. Chyle-carrying tubes are two and their main bearers are the heart and the chyle-carrying vessels (the lacteals and the thoracic duct) ; if they are penetrated, there is edema or immediate death with symptoms the same as if the heart and the main arteries are wounded. The blood-vessels are two (the hepatic artery and the portal vein) and their main bearers are the liver and the spleen, and the blood-vessels ; if the sources of the two vessels (the liver and the spleen) are penetrated, there are paleness of the skin or jaundice, fever, burning sensation, bleeding and redness of the nose. Streams of circulating protein (*mānsavaha*) are two and their main sources are ligaments, skin and the blood-vessels; if their main sources are penetrated, edema, emaciation, vascular obstruction and even death might take place. The urine-bearing tubes are

two, the bladder and the penis ; if their main sources are penetrated, there are suppression of the urine in the bladder, anuria and paralysis (insensibility) of the penis. The feces-carrying tubes are two ; their sources are the intestine and the anus ; if they are penetrated, there are constipation, offensive odor, and the tying down of the entrails (*antra*-the bowel). The seminal tubes are two : their sources are the mamma and the testicles ; if they are penetrated impotence, difficulty in seminal discharge take place. The ovarian (*ārttava-vaha*) tubes are two : their sources are the matrix and the ova-carrying tubes (the *ovi-ducts*—Fallopian tubes) ; if they are penetrated, sterility, pain in copulation and amenorrhea take place." *Susruta* III. 9. 12<sup>34</sup>.

34. तानि तु प्राणाद्वारादकरसरक्तमासमिदोमूलपुरीपश्चकार्तवद्वहानि. येषांधिकार एकेषां वहन्ति । एतेषां विहेषा वहयः । तद्र प्राणवहे इ, तयोर्मूलं इदयं रक्त-वाहिन्यश धमनः ; तद्र विहस्य क्रीश्वलिम्बनलोहनधनणेपनानि मरणं वा भवति । अप्तवहे इ, तयोर्मूलमाशयोद्वाहिन्यश धमनः ; तद्र विहस्याभानं गलान्त्रहेत्वा चहिः पिपासाभ्यं मरणं वा । उदकवहे इ, तयोर्मूलं तालु क्लीन च ; तद्र विहस्य पिपासा सद्यो मरणच । रसयहे इ, तयोर्मूलं कृदयं रक्तवाहिन्यश धमनः ; तद्र विहस्य शोषः प्राणवहिन्यवद्व मरणं तपिद्वानि च । रक्तवहे इ, तयोर्मूलं यज्ञतप्तीक्षणी रक्तवाहिन्यश धमनः ; तद्र विहस्य याचाहता चरो दाहः पाशुता शोषितातिगमनं रक्तनेत्रता चेति । मासयहे इ, तयोर्मूलं आशुतचं रक्तवहाच धमनः ; तद्र विहस्य नशयुर्मांसशोषः शिराप्रथयोर्मरणं वा । दीहे-

Here of course Suśruta has used 'srota' in the generic sense of what are described in modern anatomy as tubes, ducts, canals and cavities.

### III.—The Nervous System

"The normal 'vāyu' (nervous system) is the regulator of the physical mechanism. The nerves are of five kinds, 'Prāṇa, apāna, samāna, udāna and vyāna.' It carries out the physical attempts (muscular contractions), reveals the senses and is the carrier of the sense-perceptions as the impression, taste, smell, touch and hearing. It is the strengthener of the bodily elements (*dhātu*) and the co-ordinator of the bodily organs. It activates speech, bases of sound and hearing and is the main cause of the consciousness

वहि च, तयोर्मूलं कटीडक्षी च ; तद विहस खेदागमनं विन्धाइता तालुशीषः  
स्फुलशीफता पिपासा च । मूदवहि च, तयोर्मूलं बलिमेठुच ; तद विहसानह-  
बलिता मूदविरोधः सप्तभेदुता च । पुरीवहि च, तयोर्मूलं पक्षाश्यो गुदच ；  
तद विहसानाहो दुर्गम्भता यथिताक्रता च । गुदवहि च, तयोर्मूलं लग्नी डवची  
च ; तद विहस लीपता चिरात् प्रसिको रक्तशुक्रता च । आर्तवहि च, तयो-  
र्मूलं गर्भाशय आर्तवाहिन्दृश भमणः । तद विहायां बन्धालं भैयुगारहिष्चुल-  
आर्तवनाश्य । सिवनीच्छेदादुजाप्रादुर्भावः । बलिगुदविहसच्चं प्रागुक्तमिति । जीती-  
विहसु प्रत्याख्यायोपचरेदुकृतश्चयनु चनविधानेनोपाचरेत् ॥१२

of sound and touch. It is the source of pleasure and cheerfulness. It increases the digestive fire and eliminates from the body all the waste-products." *Charaka* 1. 12. 7<sup>ss</sup>.

"The 'prāṇa' nerves (*cerebrospinal*) are located in the brain, thorax, ears, tongue, face and nose. Spitting, sneezing, vomiting, respiration and digestion are the functions of the 'prāṇavāyī'. 'Udāna' nerves (*cervical*, thoracic and brachial plexus) are located in the umbilicus, thorax and in the neck; speaking, exertions, heat, strength and complexion are its activities. 'Samāna' nerves (*vasodilator*) are located in the sudoriferous glands and ducts, and in the lymphatics (*amvu.*) It being situated by the side of the digestive fire (bileduct ?), it increases digestive fire. 'Vyāna' (motor) nerves are spread over the entire body. Their conduction is very rapid. By 'vyāna' nerves, walking, extension, movements of the hands and feet, contraction

35. वायुस्त्रव्यनधरः, प्राणोदानसमानव्यानात्मा, प्रवर्त्तकस्त्रानासुक्षमावचाना, निषक्ता प्रवेता च मनसः। सर्वे द्वियाकासुयोतकः, सर्वे द्वियार्थानामभिबोद्धा, सर्वश्वरौप्तातुष्टुकरः, सम्भानकरः शरीरस, प्रवर्त्तको वाचः, प्रकृतिः स्वयंवद्वयोः क्लोब्यर्वनवोर्मूलम् इर्वानुषाङ्गयोर्योगिः। सनीरचोऽप्रेदीवसंयोजयः; चेता वडि-मध्याना; खूलाउचोत्तां भेता; कर्ता गर्भाहातीकाम् आयुकोऽगुच्छिप्रत्ययमूलो अवस्थापितः॥

(of muscles), the twinkling of the eyes and other activities are accomplished. *Apāna* (automatic or sympathetic) nerves are located in the testicles, bladder, reproductive organs, umbilicus (abdomen), knee, hip and the anus. The *apāna* nerves residing in the bowels, cause the elimination of semen, urine and feces and the expulsion of the ova and the fetus." *Charaka VI.* 28. 4-9<sup>34</sup>.

"The brain is the centre of the senses." *Suśruta III. 3. 18*<sup>35</sup>.

"The ten nerves (*dhamani*) of the upper

36. स्थानं प्राणस्य शीर्षोरः कर्णं जिह्वास्यनासिकाः ।  
ठोङ्गवश्चूङ्गाद्वासः हारादि कर्णे च ॥  
उदानस्य पुनः स्थानं नाभ्युरः वर्ण एव च ॥  
वाक्प्रहस्तिः प्रथमो ज्योतिश्चलवर्णादि कर्णे च ॥  
खेददीषाम्बुद्धीनि खोतांसि समधितिः ।  
अस्तरप्रेश्य पार्वत्यः समानोऽप्रियलप्रदः ॥  
देहं व्याप्तेति सर्वत्तु व्यानः शीत्रगतिन् याम् ।  
गतिप्रसरणात्पनिमिकादिक्रियः सदा ॥  
हृषीपी वक्तिमिठुच नाभ्युङ् वड्चर्षी गुदम् ।  
चपागस्यानन्दस्यः युक्तमूवशकात्क्रियः ।  
सुज्ञत्यात्तवगर्भे च युताः स्थानस्थिताच ते ॥  
स्वकर्णे कुर्वते देहो धार्थते तैरनामयः ।  
विमार्गस्या लायुक्ता वा रोगः स्थानकर्त्तौः ॥  
शरीरं पोऽयनो रूपे प्राणानाशु इरनि वा ॥

37. शिरोमूललादै उद्दिश्याणाम् ।

extremities, by activating sound, touch, impressions, taste, smell, respiration, sighing, yawning, hunger, laughing, speech, and crying, maintain the body. ... Two (auditory) carry sound ; two (optic) carry impressions ; two (lingual) carry taste and two (olfactory) carry smell. By two man speaks, by two makes (vocal) sound, by two he is asleep and by two he is awakened." *Sūcra III. 9. 4<sup>3</sup>*.

"Man sleeps when sense-organs cease to operate, being tired by the fatigue of the mind." *Charaka 1. 21. 35<sup>30</sup>*.

"Memory is caused by the following eight causes :—From the cause of impressions, (their) similarities and dissimilarities, co-ordination of the mind, practice, consciousness, concentration (of attention), what is remembered from repeti-

38. कर्णगः शब्दस्पर्शहृष्टप्रसवप्रशासीक्षुत्सज्जुष्मितश्चुल्लितकथितकृदितादीन्  
विशेषानभिवहन्नः शरोर्धं धारयन्ति । तास्तु हृष्टमभिप्रपात्तिक्षिधा आयन्ते—  
तास्त्रिंशत् । तासान्तु वातपित्तकफशेषितरसान् हे हे वहतः—ता दश । शब्दहृष्ट-  
प्रसवन्यानाभिगृह्यते । इष्याच्च भाषते, इष्यां चोषं करोति, इष्यां स्वपिति,  
इष्यां प्रतिबृध्यते । हे चाशुवाहिण्यो । हे कार्यं मित्र्या वहतः स्वरसंश्रिते ; ते  
एव शुक्रं नरस्य स्वान्नभ्यामभिवहतः । तास्तु तास्त्रिंशत् सविभागा व्याख्याताः ।  
एताभिर्द्वये नाभिहृदरपाञ्चपृष्ठोरःस्वान्नयोवावाह्वो धार्यन्ते यायन्ते च ॥४

39. यदातु मनसि काले कर्मान्वानः क्षमान्विताः ।  
विषयेभ्यो निवर्त्तने तदा स्वपिति मानवः ॥

tion of sight, hearing or perception (as tasting or smelling), is called the memory." *Charaka IV. 1. 117-118<sup>40</sup>*.

"The side-way four (cutaneous) nerves, branching into hundreds and thousands, they have become countless. They open in the hair follicles by which they carry the sweat (*sveda*) and sebaceous secretion (*rasa*). By these secretions the internal and external body is moistened and refreshed...By them the pleasure and pain of touch are felt." *Susruta III. 9. 8<sup>41</sup>*.

40

दक्षने कारणात्यर्थी अतिथैरुपजायते ।  
निमित्तरुपयहस्तात् साहस्रात् सविपर्यथात् ॥  
सत्त्वानुवन्धादभ्यासाज् ज्ञानयोगात् पुनः शुलात् ।  
हृष्टशुलानुभूताना अरण्यात् स्मृतिरुप्यते ॥।  
एततदेकमयनं मुक्तौ भौचस्य दर्शितम् ।  
तत्त्वस्मृतिबलं देव गता न पुनरागताः ॥  
अयनं पुनराल्प्यातमितद्योगस्य योगिभिः ।  
संख्यातधर्मः साख्यै च मुक्तौ भौचस्य चायनम् ॥

41. तिर्यग्गाणानु चतुर्षणा धर्मगीगामिकैका शतधा सहस्रधा चौतरीशं विभज्यन्ते, तासु सुषुङ्गेयाः । ताभिरिदं शरीरं गवाचितं विवर्जमाततत्त्वं । तासां सुखानि दोषकूपप्रतिवज्ञानि ; ये : स्वेदमभिवहन्ति रसखापि सर्वपर्यन्तर्विहित, तैरेव चाभ्यङ्गपरिषेकावगाहालिपनवीर्याल्प्यानः शरीरमभिप्रतिपद्यते त्वचि विपक्षानि तैरेव स्वर्द्धसुखमसुखं वा वर्जनाति । तास्वे ताश्चत्त्वौ धर्मव्याप्तिः सर्वाङ्गगताः सविभागा अल्प्याताः ॥८

"The waste-products (*mala*) of digested aliment, are the feces and the urine....., of lymph mucous exudation, of blood, the bile, of flesh, as the wax in the ear-tube (sebaceous secretions), of fat the sweat, of bones the nails and hair, of bone-marrow wax in the eye-pits, and of the skin oil (sebaceous fatty secretion). *Susruta* 1.46.550<sup>42</sup>.

*Kapha* (lymph), *pitta* (bile=oxidation) and *vāyik* (air=nerves) maintain the body as the moon, the sun and the air vitalize the earth by their activities of humidity (of the moon), heat (of the sun) and the conduction of heat and cold (by the air current). *Susruta* 1.21. 8<sup>43</sup>.

The above quotations tend to prove that the ancient Hindu schools of medicine believed that the body was nourished by the lymph and the blood formed out of the chyle during its passage within the liver and the spleen, was the medium of circulation and the nerves acted as the conductor of sense-perceptions of which the brain was the centre.

In the Hippocratic writings we find almost

42. कफः पित्तं मलः चेषु सेदः स्याप्रखरोम च ।

नेवविट् लघु च चेहो धातूना क्रमयो मलाः ॥५५॥

43. विसर्गादानविद्येयः सीमसूर्यानिका यथा ।

भारयति अगहे ह भाफपित्तानिकास्था ॥८॥

similar views, though with less clearness and positive assertions. In '*peri physios anthropoy*' 4-5 (= the nature of man), there are four ground principles—the blood (*aima*), phlegm (*phlegma*), yellow bile (*cholen xanthen*) and black bile (*cholen melanian*), which are described to be mixed and to circulate in the body. In the '*peri noison to tetarton*' = the fourth book of the Maladies 33), only bile is mentioned without any qualification and for the other bile, water (*udrops*) is substituted. "The sources for the blood are the heart, for the phlegm the brain, for the water the spleen, for the bile a section of the liver." 33. They are introduced into the system with the ingested food and drink, containing these principles (*peri noison* IV. 35-38). Many glands (*peri adenon*=glands 1-10) as the tonsil, mamma, lymphatic ganglions in the neck, arm-pit and groin as well as the brain, have been mentioned but not the pancreas, testicles or ovaries. The function of the glands is to absorb the superfluous liquid in the body and thus to preserve the bodily equilibrium. The largest and the most important gland par excellence was supposed to be the brain and its function was to pump and distribute the liquid in all parts of the body according to the organic needs.

Galen distinguished between the arterics and the veins. According to him the blood was formed in the liver and it was sent to the heart for the distribution in all parts of the body after the volatilized '*pneuma*' (air = the spirit = the soul) has been separated. The '*pneuma*' mixed with the air brought from the lungs, becomes the vital essence of life (animal spirit) and from the brain, circulates to all parts of the body with the nerves. Before Galen it was believed that the vital spirit (*pneuma* = air) circulated in the arteries, for arteries are always found empty after death.

According to Charaka (IV. 7. 8) there are eight handfuls (*añjali*) of blood and six of lymph in a normal healthy human body. (Because the body fluid constantly increases, or decreases, any calculation by the '*añjali*' measure can be but conjectural). There are ten handfuls of water, according to each individual's own measure—the water that after absorption, becomes mixed with feces, urine, blood and other materials of the body ; which circulating in the system, nourishes the outer skin ; which entering into the abscess under the skin, is known as '*lasikā*'; which being evaporated by the heat of the body, is eliminated as perspiration ; that water (*udaka* = serous fluid)

is ten handfuls. The material that is first formed out of the digested food and which is known as the chyle, is nine handfuls. The blood is eight handful, feces seven, lymph six, bile five (or the venous blood), urine four, 'vasā' (serum of the flesh) three, fat two, bone-marrow one, brain (or brain-serum) half handful, semen half handful and 'ojas' (prostate gland secretion) half handful."

*Charaka IV. 7. 10<sup>4</sup>.*

According to Foster (*Physiology*, p. 49), "the total quantity of blood in the human body is about one thirteenth of the body weight." Howell (*Physiology*, p. 458) says : "The ratio of weight of blood to weight of body is in the dog 7. 7 per cent ; rabbit and cat 5 p. c. ; birds 10 p. c. ; in man we have upon record two determinations on guillotined criminals made by Bischoff, which

44. यत् लक्ष्मिसङ्केशं तदुपदेशान्, तत्परं प्रमाणमनिष्टेयं तत्र उचि-  
ज्ञात्योग्नि तर्कमेव। तद्यथा दशोदकसाङ्गत्यः शरीरे स्नेहाङ्गलिप्रमाणेन यत् तु  
प्रथममानं पुरोषमनुवधात्यतियोगेन तथा मूलं इधिरप्रबाधं शरीरधातुं, यत् तु  
सर्वशरीरपरं बाह्यतः विभक्तिं यत् लग्नरे ब्रह्मगतं कासीकांशस्त्रं लभते यदो-  
प्रयानुवन्धेयोलकूपेभ्यो निष्ठतः से दशष्टमवाप्नोति तदुदकं दशाङ्गलिप्रमाणम्।  
जवाङ्गलयः पूर्वसाङ्गारपरिणामधातोर्य इसमित्याच्यते। अटी शोणितस्त्रं, सप्त पुरी-  
वस्त्रं, घट् च्छेष्यः, पञ्च पित्तस्त्रं, चत्वारो मूद्वस्त्रं, द्वयो वसादाः द्वी मिदस्त्रं, एको  
मल्लाङ्गः, भविष्यस्त्रं अंडाङ्गलिः, उड्डस्त्रं तावदेव प्रमाणं, तावदेव देशवसीजस्त्रं  
स्वेतश्चरीरतस्त्रहुतम्।

gave 7. 7 and 7. 2 per cent. Haldane and Smith however have devised a modification of Grehant's carbon monoxide method, which they have applied to living men. The results of some 74 experiments gave them an average value of only 5 per cent per man. The distribution of this blood in the tissues of the body at any time has been estimated by Ranke from experiments on freshly killed rabbits, as follows : spleen, 0. 23 p. c.; brain and cord, 1. 24 p. c.; kidneys, 1. 63 p. c.; skin, 2. 10 p. c.; intestines, 6. 30 p. c.; bones, 8. 24 p. c.; heart, lungs and great blood-vessels, 22. 76 p. c.; resting muscles, 29. 20 p. c.; liver, 29. 30 p. c."

The blood circulates in the tubular closed vessels, for thereby the pressure is increased and the time for completing the circulation is reduced. "If we take 180 grams, as the quantity in man, ejected at each stroke at a pressure of 250 mm. of mercury, which is equivalent to 3. 21 meters of blood, this means that the left ventricle is capable at its systole of lifting 180 grams 3. 21 m. high, i. e. it does 578 gram-meters of work at each beat. Supposing the heart to beat 72 times a minute, this would give for the day's work of the left ventricle nearly 60,000 kilogram-meters. Calculating the work

of the right ventricle at one-fourth of the left, the work of the whole heart during the day would amount to 75,000 kilogram-meters." Foster's *Physiology*, p. 218.

The blood is the medium through which every cell of the body is supplied with its nutritive needs. In blood circulate the synthetized elements of the ingested food. In the capillaries, the blood-plasma filters through and fills the interstitial space, bathing every tissue in the lymph-fluid, from which the cells extract the nutritive materials they need for their sustenance and growth and to which they discharge their waste products. Without blood-circulation there can be no supply of the lymph fluid for the preservation of the tissues. This is easily seen in the occlusion of the main artery of the extremity when putrefactive fermentation takes place of an animal tissue still attached to the body, known as the 'gangrene' with the production of gases as sulphuretted hydrogen and volatilized fat, which gives the bad odor and the iron-content of the hemoglobin is precipitated into sulphide of iron which imparts to the limb a range of colors commencing in green and terminating in black.

In addition to supply the nutritive fluid to the cells, the chief function of the blood is to carry

oxygen with hemoglobin, hormones and glandular secretions for tissue respiration, oxidation, and stimulation and in the intercellular oxidation, heat of the body is generated. When the oxygen of the blood is reduced and it comes back to the heart through the veins to be sent to the lungs, to be charged with oxygen, it is of purple color, but when it is loaded with oxygen, it is sparkle bright-red. The venous blood contains many waste products of the cells, dissolved in it as the ammonium carbonate, urea, urates, xanthin bases, carbonic acid as carbonates, cholesterin and other substances.

Charaka and Suśruta formed right conception of the function of the blood and the lymph in broad general outlines. Of course it was not possible for them to know their complex functional utilities in detail. Nor do we yet know. But they thought that the nerves were also tuberal vessels, through which flowed the vital force of life, something too fine for the eyes to see and which brought the sensory impressions to the central nervous system for co-ordination and carried the motor impulses to the periphery. It was invisible but mighty like the air which brings heat and cold waves, storms and tempests (*Charaka* 1..12. 6 ) or like blowing with bellows which in-

tensifies the fire of the furnace and which it was compared to and identified with. But the exact nature of the nerve impulse and the mode of its conduction, is not yet completely understood. It is usually compared with the electric current. But the sensory and the motor nerves are different, the sensory fibres only bring impressions to the nerve-centre, while the motor only carry them from the centre to the periphery. Yet histological or chemical examination hardly reveals any structural differentiation. Moreover the propagation and the velocity of the nerve-force depends on the nature and locality of the nerve-fibre, the temperature and the pressure. The nerve-fibre is one of the units of a nerve-trunk : it is the axis-cylinder process of a neuron and is either medullated, that is, surrounded by a white substance called myelin, or non-medullated ; either the medullated or the non-medullated may or may not be surrounded by the primitive sheath or neurilemma, so that there are four forms of nerve-fibres. The neuron is the cell unit of the nerve-fibre and the neurons propagate their impulse by contact of the dendrites, the terminal arborization round the axon. The neurons also differ greatly in size, shape and internal structure and they are generally classified as the bipolar and multipolar cells.

This structural variation explains the difference in speed of nerve impulsion. Helmholtz found that the motor nerve of a frog travels with the velocity of 28 to 30 meters per second and the researches of Piper indicated that the motor nerve of a man travels at the velocity of 117 to 125 meter per second. There does not seem to be any structural difference between two afferent or efferent nerves, as for an example, between auditory and olfactory, and in their mode of conduction and speed, and if they carry different impressions and impulses, it is because their terminal endings have been developed to catch particular impressions and the lobe in the brain has been specialized as an economy to the system to receive, co-ordinate and react only to special impulses. It is just like two electric wires one of which has been connected to ring the bell and the other to make light.

By the specially adapted peculiar structure of the retina, the vibrations of light (color-images = *rūpa*) can be focussed upon it, setting up nerve-impulses that are transmitted by the fibres of the optic nerve and optic track to the visual centre in the cortex in the brain, which is situated in the occipital lobes, for co-ordination, color-consciousness and response to the stimuli. Total blindness

follows the removal of both occipital lobes. But if only one lobe is ablated or injured, there is a partial blindness, affecting the symmetrical halves of both eyes known as '*hemipia*' ; the right one influencing the two right halves of the eyes, and the left one, the two left halves of the retinas.

The *outer ear* is so constituted that when the vibrations of matter, the rapidly alternating variations of pressure, what is commonly known as the 'waves of sound', forced through the acoustic apparatus, strike against the auditory epithelium, richly supplied with the nerve-fibres of the cochlear branch, and the sensory impulse thus generated is carried over the auditory nerve (eighth cranial-nerve) and track to the auditory centre in the first convolution of the 'temporal auditory lobe,' where auditory consciousness is developed.

The *taste (rasa)* nerve fibres are distributed to parts of the buccal cavity and especially the tongue, of which the most sensitive parts are the tip, the borders, and the posterior portion of the dorsum in the circumvallate papillae. The anterior two-thirds of the tongue are supplied with sensory fibres from the lingual nerve (a branch of the fifth nerve) and the posterior third from the glossopharyngeal. The nerve track has not

yet been definitely known, but it is supposed to terminate in the hippocampal convolution, posterior to the olfactory lobe. The gustatory sensation is possibly complex. There are but four fundamental taste sensations,—namely, sweet, bitter, acid, and salty and the rest are but the combinations of these primary tastes, for the experience of which we are dependent on the terminal organs which are chiefly present in the fungiform and circumvallate papillæ. And there are so many complex and multiple junctions between the fifth nerve, the seventh nerve and the glossopharyngial nerve, by way of the Vidian nerve, petrosal nerves, tympanic plexus, the otic and the splenopalatine ganglia, that it is hard to determine, how the taste sensation travels, but perhaps through the chorda tympani nerve.

In the *nasal septum* and a portion of the upper turbinate bone, the area corresponding to about 250 square millimeters in each nostril, there is a profuse distribution of the fibres of the olfactory (*gandha*) nerve, in the shape of elongated, epithelial like cells, each of which bears on its end a tuft of six to eight hair-like processes. And there are tiny glands which keep the mucous always humid and moist.

Particles of odoriferous matters, carried in a gaseous medium, namely the air, to the olfactory epithelium, become dissolved in the thin layer of fluid that keeps the nasal membrane moistened and this percolates through and stimulates the nerve-endings. But if the membrane be too dry or the secretion be too abundant or altered in quality, the power of smelling is diminished and even may be wholly suspended. The olfactory nerve terminates in the cortex of the brain in the '*cornu Ammonis* and *hippocampus*.' The animals with highly developed sense of smell possess a large '*limbic lobe*.' Some of the substances retain their odoriferous quality even in minute dilution as camphor 1 : 400,000 ; musk 1 : 8,000,000 ; vanilin 1 : 10,000,000 parts.

The touch (*sparsa*) is a compound sensation of pressure, warmth, cold and pain, through four distinct kinds of nerve-fibres which are not only richly distributed over the general cutaneous surface, but also in the buccal and rectal membranes. But the alimentary membranes, or the superficiæ in the interior of the body are supplied with nerve-fibres of pain and devoid of those of touch and température sensations. Application of cocaine on the eye

or throat paralyzes the feeling of pain and pressure, but the sensations of heat and cold are not influenced, which proves that their nerve-fibres are different and mediate through different channels. It has been clinically observed that the compression of the cords of the brachial plexus, resulted in the insensibility of the arm to pressure and temperature, but not of pain. And it is supposed the nerve-endings of pain lie deeper than the tactile senses, which are superficial ; the former mediating through the spinal cord and the latter through the posterior funiculi, together with some of the fibres of the muscle sense and they do not cross until after they reach the medulla and perhaps they are represented in the rolandic area.

*The vocal sound or voice (ghoṣa)* is distinct from speech, which is an articulate sound to express definite ideas. The animals are endowed with vocal power, but not with speech. And there may be speech without voice as in whispering and voice without speech as in singing a musical tone. The vocal organ, the larynx, resembles to a great extent the siren in the production of tone. The larynx is a framework of cartilages, connected with elastic ligaments, which are vocal cords, and it opens above into

the cavity of the pharynx and below into the trachea or windpipe. With respiration, the lung acts as bellows, pressing a blast of air through the thin tube of the windpipe and the escaped air is modulated by the movable ligaments into various tones. The voice has three characteristics, (1) '*loudness*,' which depends on the force of the expiratory blast; (2) '*pitch*,' which depends on the rapidity of vibrations and (3) the '*quality*' which depends on the capacity of the resonance chamber and the muscular strength and pliability of the laryngeal ligaments (vocal cords). The alternate expansion and contraction of the ligaments and muscles of the larynx (*glottis*) are made by the bulbar and recurrent laryngeal nerves. If any of these nerves is destroyed, the rhythmic widening and narrowing automatically cease and the glottis remains immobile and no voice (vocal sound) can be produced.

There are four *speech* (*bhāṣā*) *centers*, situated along the Sylvian fissure, in the left hemisphere for the right-handed and in the right hemisphere for left-handed individuals. The motor center for pronouncing and articulating words, occupies the foot of the third frontal convolution (left), immediately in front of the

centers of phonation, utilized in speech. The destruction of this center produces motor aphasia (*aphemia*). In aphemia one is able to hear and to understand when spoken to, and is able to emit sound, to move the tongue and the lips, but he has lost his vocabulary, in other words, the faculty to articulate words. But if the injury is not complete; that is, in partial aphemia, the patient can utter a few incoherent words and syllables according to the nature of the lesion. The center for auditory images, that is, for comprehending spoken words, occupies the posterior fourth of the first temporal convolution (left). The destruction of this center causes sensory *aphasia* (word-deafness). In sensory aphasia, one can hear the voice, as the faculty of hearing is not affected, but he can not understand the spoken words, and the words are to him mere sounds and do not express any idea. The center for visual graphic images, that is, for distinguishing written or printed words, occupies the left angular gyrus (posterior inferior part of the left parietal lobe). The destruction of this center causes *alexia* (word-blindness). In alexia, one can not read even his own writing, although his vision and intelligence are not affected and he can see the form

of the letters, but has lost the faculty of comprehending ideas, expressed through those words. The center for the faculty of writing, is situated at the foot of the second frontal convolution and the destruction of this center produces the inability to write (*agraphia*). In *agraphia*, one has lost his faculty of expressing his ideas in writing or any graphic form. *Agraphia* is usually associated in clinical experience with motor aphasia (*aphemia*).

*Sleep* (*nidrā*) is evidenced by the cessation of sensory-motor reaction. Various hypotheses have been advanced to explain the causation of sleep. (1) Cerebral anemia was suggested by the old writers ; but it is rather the effect than the cause of it. (2) Hyposecretion of the thyroid due to the inhibitive action of the accumulative waste products during waking hours and the hyper-secretion of the pituitary body ; but in myxedema, drowsiness is not constant, nor is there any proof that in hypnotic or epileptic somnolence, there is any increased secretion of hypophysis, or diminished secretion of the thyroids. (3) Osmotic theory of Devaux, which tries to explain sleep due to the increased viscosity of blood, through dehydration, is not substantiated by observation, as in privation of

water—in thirst, the nervous system is rather irritated. (4) Chemico-toxic theory enjoys a better reputation. The accumulated tissue-waste products as lactic acid, cholesterine, leucomaine, exercise an inhibitory action on the cerebral activity, either paralyzing the centre directly, through intoxication or indirectly by reflex vaso-constriction. (5) Accumulation of carbonic acid which has an extreme avidity for oxygen, reduces the minimum ratio of free oxygen, necessary for the central nervous activities. (6) Consumption of the intramolecular oxygen causes cerebral asphyxia, which is expressed as sleep, as during the waking hours, the brain cells use up their store of oxygen more rapidly than it can be replenished by absorption from blood ; the consequence is that for lack of respiration, the brain-cells can not react to the sensory stimuli and gradually losing consciousness, store up sufficient oxygen through the anabolic process to be awakened up again. (7) The neuron theory tries to explain sleep on the histological principle that the nerve track is not continuous like the electric wire, but composed of the cell-units (neuron) which transmit their impulse from one to the other by their contact through the interlacings of dendrid-

ed and terminal arborizations, and when there is sufficient accumulation of fatigue products, the dendrides contract and retract, so that the nerve-path being broken and the brain being automatically relieved from sensory stimulation, sleep is mechanically produced. But it has not yet been proved that the dendrite processes are contractile enough as to lose all connections with the neighborly cells. (8) A central nervous mechanism produces sleep, not as a result of asphyxiation, toxins or neuro-toxins (*Bouchard*), but to prevent them and to protect the brain-cells from the evil effect of their further accumulation, so that during enforced involuntary rest, the obnoxious products can be eliminated and the brain-cells can be refreshed and revitalized through the anabolic process (the income of energy being more than its expenditure)—as an economic accommodation to self-preservation. If the sleep is deep, profound and undisturbed, it will take less time than otherwise to oxygenate, tonicize, recuperate and vitalize the brain-cells for the resumption of their activities of sensory-motor co-ordination and reaction.

*Hunger and thirst (kṣut-pipāsā)* sensations are mediated, probably through the nerve endings

in the stomach and pharynx. Normal hunger is known as the appetite and it is not yet definitely determined whether this impression is conveyed by sensory fibres, distributed to the mucous membrane of the stomach or of the muscular coat. When the stomach is empty, these peripheral nerve-endings are excited. That it has nothing to do with nutritive needs of the organism, is evidenced by the fact that when water or indigestible substances are taken in to fill the stomach, the hunger sense is allayed. From this, it can be concluded that hunger is a gastric sense. Of course, when there is a general tissue hunger for lack of nutrition, a general nervousness and discomfort are experienced, due to the resultant nervous excitation. The water needs of the body are experienced through the fibres of the glossopharyngeal nerve as an end organ of thirst, for we know, that if the pharynx is dried up either by salty or saccharine food, dried air or dust, at once there is a sensation of thirst, though there may be no bodily need for it and it can be appeased by removing the irritant substances and moistening the spot. It is possible that when the tissues give up their storage of reserve-water to compensate the loss of the blood, it constantly incurs through respiration, perspiration and

urination, there is a general call for supply of water, and it first expresses the demand through the excitability of the glossopharyngeal nerve, and if it is extreme through general nerve excitation and irritation, as in tissue hunger.

*Sweat (sveda)* is the secretion of the sudoripareous glands, of which, there are nearly two millions (*Krause*), distributed all over the cutaneous surface, except the glans penis, prepuce and the deeper portion of the external auditory meatus. It is known that with vaso-dilation, their secretion is increased. But it can be also produced independently, directly through the excitation of the nervous mechanism, as is seen in strong emotion, cold-sweat of phthisis and other diseases, when the skin is in anemic state. The stimulation of the sciatic nerve in cat, has been demonstrated to produce profuse sweating on the hairless balls of the feet. But when an animal with sciatic nerve divided on one side, is made dyspnic, no sweat appears on the hind limb of that side, though there is abundance in the other, thus clearly proving a central nervous mechanism, regulating sweat-glands as vaso-dilation. It seems that picrotoxin and strychnia induce sweating action by influencing the central nervous system while nicotin induces perspira-

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tion by acting both centrally and peripherally. As histologically and anatomically the nerve-fibers of the sweat glands and the vaso-constrictors resemble very closely, it is reasonable to presume, that like the latter, the central nervous regulator of the sweat glands is in the medulla.

*Sebum (rasa)* a semiliquid oily material, that is secreted by the sebaceous glands, distributed all over the cutaneous surface, chiefly associated with the hair follicle, but also without it as in the glans penis, lips and the deeper portions of the external auditory meatus, is meant possibly to protect the skin from bacterial invasion, and to prevent the hair from being brittle. Sebum on exposure to air forms a waxy cheesy mass as is seen in the comedones from the occlusion of the ducts, or in the glans penis (*Smegma preputti*) or in the auditory meatus (*cerumen = ear-wax*) and it contains fats, soaps, cholesterin, albuminous material (casein like), remnants of epithelial cells and inorganic salts. As the sebaceous secretive activites are associated with vaso-dilation, it is presumed that their nervous mechanism is the same, although sebum by its oil coating over the skin prevents the undue loss of heat as well as prevents the undue absorption of moisture. Vaso-dilation and vaso-constriction

are regulated by the nerve-fibres belonging to the sympathetic or automatic nervous system.

*Heat ( uṣmā )* is produced as a reaction of the intracellular oxidation or vital process and absorbed in the blood, it is conveyed to every part of the body to preserve the temperature equilibrium of the hot-blooded animal. For heat is being constantly lost from the body through radiation (conduction), evaporation (perspiration from the skin), respiration (vaporization of water through Jungs), and with urine and feces. If there is excess of heat, it is conducted to the periphery and is radiated with sweat by vaso-dilation. If on the other hand, the surrounding air is cold and the body needs to conserve its heat, there is vaso-constriction so that the escape of heat is reduced, as well as the production of heat is stimulated by increased oxidation. In cold-blooded creatures as fish, amphibia, reptiles or in the hibernating animals (*poikilothermos*), either the oxidizing process is not yet intense as in the former, or the heat-regulating mechanism is absent or poorly developed as in the latter, and the consequence is that their body temperature fluctuates with that of the surroundings. While the hot-blooded animal (*homoiothermous*) keeps relatively a constant temperature.

independent of the surroundings. There is every reason to believe that the heat-regulating mechanism ( tissue-oxidation for the production of heat, conservation of heat through vaso-constriction, and radiation of heat through vaso-dilation ) is controlled by a nervous center, which perhaps is situated either in the pons or medulla.

### III. PATHOLOGY

"Whatever causes pain, is a disease (*vyādhi*). Diseases are of four kinds : accidental or mechanical (*āgantu*), physical (*sārira*), mental (*mānasa*), and natural (*svābhāvika*). Diseases caused by injuries are 'āgantu' ; of alimentary origin and by the derangement of the nervous, venous, lymphatic and arterial systems, 'sārira' ; through anger, sorrow, fear, joyousness, sadness, jealousy, concentration of mind, misery, haughtiness, greed, envy, desires and longings, 'mānasa' ; hunger, thirst, senility, sleep and death, are 'natural' diseases". *Suśruta I.I. 20*\*\*.

"Again, the diseases originate from seven sources as follows: hereditary (*ādivala*), maternal (*janmavala*), alimentary (*doṣavala*), mechanical (*saṃghātavala*), physical (*kālavala* = seasonal ),

44(a). तद्दुःखसंयोगा व्याधय इत्यच्यन्ते । ते चतुर्भिर्धा आगन्तवः शारीरा  
मानसा स्वाभाविकास्ते ति । तेषामागन्तवोऽभिचातनिमित्ताः । शारीरासूक्ष्मपाणमूला  
बाल-पितृ-कफ-शोषित-सज्जिपातवैष्वयनिमित्ताः । मानसासू क्षोध-शोक-भय-हृष्ट-विचा-  
हृष्ट-व्यथा-दैर्घ्य-मातृसर्प्य-लीभ-काल-प्रभृतय इत्यावे वर्षेद्दर्भवन्ति । स्वाभाविकाः  
चतुर्पिपासान्तराष्ट्रव्युग्निद्रापृ तयः । सुश्रुत, स्वस्थानम्, १, ३० ।

**contagious (*daivavala*), and natural (*svabhāvavala*)**  
***Sūtrata I.* 24. 4“.**

“The diseases that are transmitted through the lesion in the sperm or the ovum of the parents, are hereditary, as ‘*kusṭha*’ (leprosy—there is every reason to believe that the syphilic eruption of the skin and ulceration were regarded as varieties of leprosy) and ‘*arṣa*’ (hemorrhoids). The hereditary diseases are of two kinds and might come either from father or mother’s side.

“The diseases that are produced through the improper regimen (*apachara* = wrong food and injurious exercise) of the mother (during the intra-uterine life of the fetus) are called maternal as born—lame, blind, deaf, mute, ‘*minmina*’ (one who speaks with a hissing nasal accent, due to overgrowth of adenoid tissue in the rhinopharynx) and the dwarf. These diseases (acquired during the intra-uterine life) are caused by either) mother’s (defective) circulation (*rasakṛta*) or miserable living.

“The diseases that are produced through improper food and living, or (reacting through

45. तत् तु सप्तविधे व्याधिशुपनिपतति । ते पुनः सप्तविधा व्याधयक्षद्यथा—  
 आदिवलप्रहर्ता जग्नवलप्रहर्ता दीपवलप्रहर्ता: संघातवलप्रहर्ता: कालवलप्रहर्ता  
 देववलप्रहर्ता: स्वभाववलप्रहर्ता इति । सुशुत्सु हिता, सूतस्थानम्, २४, ४ ।

digestion) anxiety, are '*alimentary*'. Alimentary diseases are of two kinds—gastric and intestinal occasioned by physical causes (as improper food and living) or mental causes (as anxiety, fear or nervous excitement).

"(The diseases occasioned by) the injuries struck with force on the weak, are '*mechanical*' whether by instruments or by ferocious animals.

"The diseases that are produced by cold, heat, wind and rain, are '*physical*', whether (they) are natural or unnatural.

"The diseases that are produced by the tyranny of the gods (through thunder and lightning), through curses (*phobia*), sorceries of the *Atharva-veda* (infectious diseases), and through contagion (syphilis) are *daiva-vala* (god-sent, i. e. beyond human control). These diseases are of two kinds as occasioned by thunder-lightning or by demons (infectious diseases as cholera or small-pox). And again they are of two kinds—through accident (as thunder-lightning) or through contact (as syphilis).

"Hunger, thirst, senility (old-age), sleep and death etc. are natural diseases. They are of two kinds—timely or untimely. They can be cured

when they are untimely ( i. e. if there is hunger, thirst or premature senility, when there is no reason for it, they are proper subjects for treatment ), but not so when they are timely."

*Susruta* 1, 24. 5-7<sup>40</sup>.

"In addition to ( parasitic ) animalcules ( that cause disease), there are twenty kinds of microbes ( *krimi* ) divided into four classes." *Charaka* III. 7. 6<sup>41</sup>.

"The origin of the microbes of the blood-vessels ( veins ), is like that of leprosy. Their

46. तदादिवसप्रहता ये शुक्रयोचितदोषान्वयाः कुष्ठाशःप्रभृतयः ; तेऽपि विविधा नाटजाच् । अन्यवस्थप्रहता ये नातुरपञ्चारात् पशुजात्यन्वयविरसूक्तमिन्द्रिय-वासनप्रभृतयो जायन्ते ; तेऽपि विविधा रसज्ञता दीहदापञ्चारकलाच् । दोषवस्थप्रहता य आतहसमुत्पद्याः मिथ्याहाराचारंभवाच् ; तेऽपि विविधा आमाद्यसमुत्पद्याः पक्षाश्वय-समुत्पद्याच्, पुनर्य विविधाः शरीरा भागसाच् । एत आधारितिकाः ॥५॥

संघातवस्थप्रहता य आगलबो दुर्बलस्य वज्रविविहात् ; तेऽपि विविधा शखङ्गता अव्यादिङ्गताच् । एत आधिर्मीतिकाः ॥६॥

कालवस्थप्रहता ये शीतोच्चवातवर्षाप्रभृतिमित्ताः । तेऽपि विविधा व्यापदत्तुकृता अव्यापदत्तुकृताच् । दैवतवस्थप्रहता ये दैवद्रीहादभिश्चका अर्थर्वकृता उपसर्गकृताच्, तेऽपि विविधा विद्युदविनिकृताः पिण्डादिङ्गताच्, पुनर्य विविधाः संसर्गं आकृतिकाच् । स्खलावस्थप्रहताः चुत्पिपासाजाराव्युग्मिद्राप्रभृतयः ; तेऽपि विविधा कालज्ञता अकाल-ज्ञताच् । तद यत्तिरवस्थज्ञताः कालज्ञता अपरिरक्षणकृता अकालज्ञताः । एत च. चिदेविकाः । तद सर्वव्याध्यरोधः ॥७॥ सनुतस्त्रिता, सदस्यानम्, १४, ५-७ ।

47. विश्वलिविधाः लिनयः पूर्वहुहिता नानाविधेन प्रविभागेनान्वय सहजेभः । ते पुनः प्रङ्गतिभिर्विभज्यनानाशंतुर्भिर्विधा भवति । चरकस्त्रिता, विमानस्यानम्, ३, ५ ।

habitat is the blood-vessels. They are very minute, globular and without feet. Many of them are so minute that they are invisible."

*Charaka III. 7. 7<sup>48</sup>.*

Pathology or the science of disease, has up to the last century, been rather vague owing to the complexity of reaction of the pathogenic agents upon the living matter. Bacteriology is entirely a modern science. A few years ago it was not even suspected that infectious diseases are due to the intervention of morbid microscopic agents. Their very existence was not even known. Microscopy and chemical reagents have but recently revealed the most interesting teeming world of animalcules, which though invisible to the naked eye, are no less potent adversaries of the living beings, and there is a constant struggle between life and these invisible foes, to which it ultimately succumbs, and in spite of the relentless war of science for the last generation, it has not been able, but partially, to conquer and to control them. Even the diseases that we call organic, as the cardiac

48. शोषितजागान्तु कृष्णः समानं समुद्यानम् । स्थानं रक्तवाहिनो भूमध्यः संस्थानमयो वृत्ताचापादाच । सूक्ष्माच एके भैरव्यहृष्टाः । चरकसंहिता, विलास-स्थानम्, ३, ७ ।

affection, or metabolic as gout, may be the manifestations of the accumulated reactions of pathogenic germs, which have disappeared long ago, as pneumococci and gonococci respectively. This is clearly seen in tabes dorsalis, as a sequel of syphilis, after twenty or thirty years of infection.

The ancient conception of disease was based more or less on humoral pathology, i. e. disease originated from the derangement of the humors and it was the function of the diet and medicine and proper living, to bring them back to their normalcy and equilibrium. According to the Hindu schools of medicine, there were three fundamental humors (*vāyu*, *pitta*, *kapha*), according to the Greek, four (blood, phlegm, bile and water by some, yellow and black biles by others) in the human body. '*Vāyu*' is the active principle like the wind, which brings hot and cold waves ; '*pitta*' is the heat principle like the sun ; and the '*kapha*' is the cold principle like the moon, whose beams were reputed to exercise a very soothing and beneficial influence on plant life, in contradistinction of the sun's rays which were supposed to have a scorching effect, as it usually happens in an arid tropical climate. (*Susruta* I. 21. 8). As for the luxuriant vegetable life and

growth, all these three elements in their right proportion are necessary, and excess of either, heat, cold or wind, is injurious to the plant, as in the animal kingdom.

However fanciful and grotesque this appears at the first glance to the moderner, it is not really so when it is seen with clear perspective and sharp analysis. It is true that concrete facts and statements appeal more to reason than vague generalization and abstract philosophy. But by close observation it will be easily observed that their '*vāyu, pitta, kapha*' correspond, to what is expressed in vulgar terminology, as '*nervous, sanguine and phlegmatic temperaments*' and which can be translated into medical nomenclature as '*hypermetabolism, normal metabolism and hypometabolism*'. The following citations tend to lead to the aforesaid conclusion :—

"The bodily oxidation (*agni*) is classified into four kinds according to its activities as follows :— hyper-(*tikṣṇa*), hypo-(*manda*), normal (*sama*) and abnormal (*vīṣama*). Of them (one of) hypermetabolism is able to bear all abuses (i. e possesses a great resisting power against infection); hypometabolism has its opposite qualities; normal metabolism becomes (easily) upset by abuse, but without abuse, remains

natural ; abnormal metabolism has the opposite qualities of the normal." *Charaka III. 6. 6<sup>o</sup>*.

"These four kinds of oxidation pertain to man. Those who have *vāyu*, *pitta*, *kapha*, in proportion ( equal ), enjoy normal oxidation. In the case of those who have predominance of *vāta* ( nervous temperament ), oxidation becomes abnormal by association with *vāyu*. In those who have predominance of *pitta* ( sanguine temperament ), oxidation becomes accentuated by its association ( hyper-oxidation ). In those who have predominance of ' *slesma*' ( phlegmatic temperament ), their oxidation becomes lowered by its association ( hypo-oxidation )." *Charaka III. 6. 7<sup>o</sup>*.

"The dominant qualities at the time of union of

49. अग्निं तु शारोरेतु चतुर्भिंशो विशेषो बलमेदेन मवति । तद्यथा तीक्ष्णो  
मन्दः सभो विषमस्थेति । तत्र तीक्ष्णोऽपि: सर्व्यापचारसङ्गः, तद्विपरीतव्यवस्थासु मन्दः,  
समस्तु खलपचारतो विज्ञातिमापयते, अनपचारतस्तु प्रक्षालादेवावतिष्ठते । समव्यवस्थ-  
विपरीतव्यवस्थासु विषमः । चरकसु'हिता, विमानस्थानम्, ६, ६ ।

50. इत्वेति चतुर्भिंशा भवन्त्यप्यव्यवतुर्भिंशानमेव पुरुषाणाम् । तत्र समवात-  
पित्तज्ञेयसाम् प्रकृतिस्थानां सभा भवन्त्यप्ययो वातस्थानान् वाताभिभूतेऽप्यपिडाने  
विषमा भवन्त्यप्ययः । पित्तस्थानान् पित्ताभिभूते आप्यपिडाने तीक्ष्णा भवन्त्यप्ययः ।  
द्वेषाणामान् द्वेषाभिभूते आप्यपिडाने मन्दा भवन्त्यप्ययः । चरकसु'हिता, विमान-  
स्थानम्, ६, ६ ।

the sperm with ovum, are inborn (with the baby), as temperament (*prakrti*). *Suśruta* III. 4. 48<sup>51</sup>.

"The man of nervous (*vāta*) temperament, is sleepless (*jāgaruka*), sensitive to cold, ill-tempered, exclusive (*stena*=thievish), haughty, unmannerly (*anārya*=un-arian), fond of music, songs, dance and arts (*gandharvachitta*), whose hands and feet are long, whose beard, hair and nails are very dry, who is excitable (*krodhālu*=angry) and strike people with hand and nails. That person is impatient, whose friendship is unstable, (who is) ungrateful, thin, violent, whose veins show out throughout his body, (who is) garrulous, who walks fast, is fond of walking and is fickle-minded." *Suśruta* III 4. 59<sup>52</sup>.

"The man of sanguine temperament (*pitta*) perspires freely, smells come from his body (from volatile oil), his body has the yellowish color

51. शक्तिर्णितसंयोगे यो भवेष्वोष उत्कटः ।

प्रकृतिर्णायते तेन तस्या मे लक्षणं प्रण ॥ समुत्संहिता, आरो-  
खानम्, ४, ५८ ।

52. तद जागृकः शीतहेषी दुर्भगः सेनो मत्सर्थनार्थो गाम्बर्यचिच्छः क्षुटित-  
करचरणोऽतिरक्षमशुभ्रखेशः क्रोधो दन्तमखखादी च भवति ॥

अधितिरड्डसीड्डः कृतज्ञः कृशपद्मो धमनीततः प्रलापो ।

द्रुतगतिरट्टनोऽगमस्थितात्मा विद्यदपि गच्छति संबन्ध सुप्तः ॥ समुत्संहिता,  
आरोखानम्, ४, ५९ ।

and is relaxed ; and his nails, eyes, forehead, tongue, cheeks, and palms of hands and soles of feet are copper-colored ( indications of good circulation of blood ) ; he becomes repugnant when he gets wrinkled (*vali*), gray-haired (*palita*) and bald-headed (*khālitya*) : he is a voracious eater, sensitive to heat and he becomes easily angry and easily satisfied ; his strength and longevity are medium. A man of sanguinary temperament is brainy (*medhāvī*), clever and is an authoritative speaker ; in combat he is brave and irresistible.” *Susruta III. 4. 61<sup>ss</sup>*.

“The complexion of a man of phlegmatic (*slesma*) temperament, is like the grass, blue lotus blossom or wet *ariṣṭa* (soap-tree), sharpened sword or the shaft of an arrow (i. e. fat and bright.) He is pleasant to look at, fond of eating sweet things (it is well-known that in myxedema or cretinism there is a great fondness

53. स्वेदनो दुर्गमः पौत्रशिलाहस्रावनखनयनतासुजिङ्गीष्ठपाचियादत्तो  
दुर्भगो बलोपलितक्षालित्यजुटो बहुभुग्यते श्विप्रकोपमसादो मध्यमवलो मध्यमाकुर्व  
भवति ॥६१॥

मिथावो निपुणमनिर्विग्रह्य वक्ता

तेजस्वी समितिषु दुर्विचारवीर्यः । सुशुत्तसंहिता, आरीर-  
स्थानम्, ४, ६१ ।

for sugar and high tolerance for carbohydrates), obliging, lazy, patient, without desires, heavy, indifferent and thick-bodied." *Susruta III. 4. 65<sup>54</sup>*.

One can see here almost the true clinical picture of hyper-thyroidism in an advanced state, in the primary stage and hypo-thyroidism. Thyroid influences metabolism. With metabolism is inter-locked the automatic bodily mechanism of self-defence against infection. It is well-known that our integuments and mucous membranes swarm with innumerable pathogenic germs which almost live a harmless, vegetative parasitic life, but if the organism is devitalized by overwork or malnutrition, if its immunizing resisting power is lowered, in other words, if its defensive mechanism has been weakened, then infection takes place. We inhale almost with every inspiration plenty of *bacillus tuberculosis* and they lodge in our nostrils and lungs, we harbour in our intestine enough of *coli-group*, but they can not do any harm as long as our metabolic activities have not been lowered

54. दूष्ये न्दीवरनिति शार्द्धरिट्टवरकाष्ठानामन्तमवयः सुभगः प्रियहर्षनो  
मधुरप्रियः क्लतज्ञो इतिमान् सहित्युखोऽनुपो वस्त्राविचरयाही दद्वैरेत्य भवति ॥ सुभग-  
संहिता, शारोरस्वानम्, ४, ६५ ।

beyond the danger point. So far pathogenesis, vitality of the organism, is the important factor. This vitality classification, coefficient with metabolism and oxidation, is practically synonymous with *vāyu* (=air) as a conductor of hot and cold waves, *pitta* (=heat principle), *kapha* (=cold principle), which we are justified to translate as the nervous (*hypermetabolism*), sanguine (*normal metabolism*) and phlegmatic (*hypometabolism*) temperaments, and on which the whole system of the Hindu medicine is based. If there are points in which the picture drawn by Charaka varies from modern clinical observation (as bad smell and premature senility in sanguine temperament, and strength in phlegmatic type), it should not be forgotten that, there have been evolutive changes with time both in the pathogenic agents and our system, from the time of the ancients and consequently reactions have been partially modified. Moreover, it is good to remember that for the age in which Charaka and Suśruta lived, their studies strike our admiration from the comparative historical point of view, but for modern practical needs, they are nothing but crude and vague generalizations.

## I. CONSTITUTIONAL PATHOGENESIS

We can quite agree with Suśruta (I. 120) that 'whatever causes pain, is a disease'. But the definition will be more logical and correct if we say, "Disease is the state of body and mind, produced in the organism, by a morbid agent and the organism reacting against it."

It is yet controversial whether infections are transmitted by heredity (*ādivala*). According to Weissman (*gemules* of Darwin and *plastidules* of Haeckel are now practically discarded as bearers of heredity) the germplasm is a bridge between the past and the present, linking man to the first-developed unicellular existence. The germplasm or the germinative cell assures the continuity of life and progress. In the lowest step of the ladder in animal life, among protozoa, reproduction takes place by fission, budding or both combined when the mother cell, through excess of nutrition divides into two as a relief of cellular tension. With the growth of organic life and specialization of cells as an economy for functional utilities, special cells (*gamets*) have been developed for reproduction. In further evolution, gamets have been differentiated into female gamet (*ovum*) and male gamet

(*spermatozoon*). Their amphimixis tends to cause variation, while the germ-plasm tries to conserve the type. Hence inspite of infinite variety, never two beings being the same, there is a fundamental unity of the species, as modifications are very slow.

The germplasm—the bearer of heredity, is the "chromatin" substance of the reproductive cell-nucleus. The chromatin divides into chromosomes (*idants*) and when they break up again, the smaller units are called chromomerés (*ids*) and each chromomere or '*id*' contains all the dynamic potentialities—generic, specific, individual, which under appropriate nutrition and temperature, forms the organism. Each '*id*' is surrounded by hypothetical units, called the '*determinants*' and determinants by '*biphores*' which are supposed to exercise the directing influence in the development of phylogenetic evolutive transformations. Though immortality of the germ-plasm can be maintained without amphimixis, as in parthenogenetic eggs or by artificial parthogenesis in normal ova as demonstrated by J. Loeb, in higher plants and animals however, sexual conjugation is the normal process. Conjugation or fertilization means the reducing division of the chromosomes and the restoration of the normal bulk in the fertilized

ovum by equal contribution from both the parent cells. The stimulus which activates the fertilization is a chemotactic substance liberated by both the cells, but it seems that if the ovum is stronger as in the final stage, there is a protoplasmic outgrowth towards the spermatozoon. The protoplasm contains nutritive materials for the embryo.

Inheritance of heredity is complicated by two factors. Somatic characteristics are not transmitted—but only germinal. Yet the germinal materials are influenced by somatic behaviour or functional uses. One might lose his limbs and his children would not be born without them. The Jews have been practising circumcision for the last four thousand years, yet the Jewish male babies are born with prepuce. But according to the experiments of Brown Sequard, if the sciatic nerve of a guinea pig be cut, the animal becomes epileptic and if mated, brings forth offsprings that are epileptic, though the sciatic nerve is there and has not been severed, but its functional disturbance has been fixed by heredity.

Somatic cells undergo the evolutionary modifications of the functional exercise of an organ, by which its development is regulated. Therefore the hereditary transmissions are of two kinds, germinal and epigenetic, i. e. the germplasmic ma-

terial becomes influenced and modified by the somatic behaviour, that is, by external conditions. And though the amphimixis takes place, the characteristics of both the parents are not equally blend in the offspring. It might receive the prepotent characteristics of one as in a cross between a Negro with a White, pigment and hair etc., or the recessive characteristics of the other. The sex of the offspring, according to some, depends on the maturity of the ovum, and if the fertilisation takes place in the beginning, it is male and if at the terminating period of the catamenia, it is female. If the twins are not of the same sex, it is because two ova have been fecundated at two different periods. Consanguineous marriages produce evil effects, for heredity fixes and accentuates the weak characteristics of both the parents. If a blind man marries a blind woman, there is a possibility that the offsprings of the mating would have defective eye-sight, if they are not born totally blind, but if a blind man marries a woman with good eye-sight, the negative characteristic of one would be counterbalanced by the other and children born of that marriage would not be affected probably in their eye-sight. Of course, the laws of heredity are not so simple. According to some biologists, one does not inherit more than

50 p. c. from the parents, i. e. half from the father and the mother, each one of the parents contributing about one-fourth, and each one of the grand-parents one-eighth and so on according to the geometric regressive proportion. But there may be also sudden reversion to the ancestral type and what is known as '*atavism*.' So no fixed rules of heredity can be determined. But it is certain that the parents transmit to their offspring their psychic and bodily impressions. For germ-plasms must be certainly very sensitive to the somatic impressions and transformations.

We have no definite proof that the pathogenic germs are directly transmitted with the germ-plasms. For if really the ovum or the spermatozoon be infected, then they would be incapable of fertilization, growth and development, lacking impulsive momentum, vitality and nutrition, necessary for amphimixis and embryonic formation. The frequent abortion that takes place in the primary state of syphilis, is not probably due to the presence of *treponema pallidum* in the germplasms, but due to their low vitality and exhausted condition of nutrition or the invasion of the embryo by the pathogenic germs through the placenta. Of course, there are cases known in medical history where the

offspring has been born with all the stigmata of syphilis, acquired from the father, while the mother has acquired immunity from its infection from the fetus through gradual elaboration of the antibodies, as a reaction of the organism. But it does not necessarily imply that the spermatozoon that fertilized the ovum and caused conception, had living syphilitic germ in it, or it might have been simply saturated with attenuated syphilitic virus—mild enough not to interfere with embryonic and fetal growth, yet a sufficient cause to bring forth immunizing reactions in the maternal organism, without infecting her. In the matter of hereditary transmission of infectious diseases, the question is whether the germplasms can be carriers of infective microbes? In this the father is concerned only at the time of conception. Of course at the time of copulation and conception, the father's state of health and condition, are reflected in the offspring. If the father is youthful, healthy and in happy mood, the offspring acquires a gay and cheerful disposition of mind. If on the contrary, the father is aged, or suffers from dyspepsia, malaria or liver troubles, which naturally create a melancholy frame of mind, the children inherit the appearance of premature senility. The children of youthful parents

usually inherit a mobile and agile nervous system, as in youth nerves are very sensitive and responsive to impressions. The children of gouty, tubercular or hemophiliac parentage acquire a diathetic predisposition to these diseases. In an arthritic family often are seen manifestations in different members of the family of gout, eczema, nervous affections, hepatic and renal lithiasis, diabetes and Bright's disease. But there is no conclusive evidence that the germ-plasm is a carrier of infectious germ.

But the mother's influence is much more preponderant. The fetus lives and grows in the mother's womb as a parasite for eight to ten months. For its nutrition it is dependent on the maternal circulatory system. Spermatozoon practically acts simply as a stimulant and gives the momentum to the ovum to start its anabolic evolutionary course. The child is really formed of the mother's nutrition. So her psychical and physical life vitally reflects in the formation and growth of the fetus, during the long period of gestation. If she has any infectious disease, it is very unusual, if she does not transmit it to the fetus through the placenta.

Nutritional (*dosavala*) disturbances are many and varied, and are known as metabolic

diseases. Nutrition is the function of every living cell, consisting in the taking in and assimilation through fermentative changes, whereby tissue is nourished and built and energy is liberated: its successive stages are known as digestion, absorption, assimilation, disassimilation and excretion.

Anabolism is the assimilative synthetic process, while catabolism is the retrograde disassimilative metabolism. For both these functions a liquid medium is necessary in which the nutritive substances can be in a soluble state, so that by osmotic pressure, it can percolate through the capillary wall and enter into interstitial space, from which the cells extract their food needs by endosmosis, and by exosmosis, throw out the metabolic waste products formed in the organic synthesis into the lymph stream. If any of the waste products be allowed to accumulate, the organism would die out of auto-intoxication.

So nutrition comprises various functions.  
(1) Transmission and transformation of food in the alimentary canal by the digestive enzymes, from insoluble into soluble products so that they become dialyzable: starches are saccharified, albumines are peptonised and fats are partly emulsified

and partly split up into fatty acids and glycerine. (2) Absorption of the digested soluble nutrients. (3) Detoxication, synthesis and fixation of the nutrients in the liver, especially the glucose, which is converted into glycogen. (4) Transportation of the nutrients with the blood-circulation to every tissue of the body for the food-supply of the cells, the extraction of the food-material from the plasma by the cells, and ejection into it of the waste-production of catabolism. (5) Regressive metamorphosis and reduction of harmful disassimilative products into harmless substances, chiefly in the liver as the conversion of the nitrogenous end-products into urea. (6) Elimination of the metabolic wastes through the kidneys, lungs and the skin. It has been estimated that an adult voids daily 250 grams of carbon and 18 grams of nitrogen. This must be replaced to preserve the equilibrium between the income and the expenditure of the bodily energy, or it will slowly starve to death.

Death takes place through starvation, when the body has lost nearly 45 per cent of its weight. When food is withdrawn, the organism performs its multifarious functional activities, as the pulsation of the heart, metabolism, respiration, maintenance of the body tempera-

ture, muscular contraction and excretion of waste products, by consumption of the body fat and protein, sacrificing the less useful to the more useful in the economy. Death is postponed if plenty of water is taken, for it maintains the integrity of the circulatory system and aids in the transportation of the metabolic wastes for expulsion from the body. Without sufficient consumption of water, the increased viscosity of blood and the retention of the toxic excretory substances hasten death. However, death through absolute starvation is very rare. But death through malnutrition—insufficiency or bad quality of food, especially during famine—is very common, indirectly or directly. Malnutrition weakens the vital resisting power of the organism and clears the way for the invasion of epidemics, which is usually the case, or death is slowly preceded by gradual emaciation, anemia, dropsy, cardiac and cerebral disturbances, especially delirium.

If the aliments are too abundant or of bad quality, the undigested food falls an easy prey to microbes that swarm in the alimentary canal, provoking fermentation and putrefaction, thus causing dyspepsia, lientery auto-intox icationn dilatation and catarrh of the digestive tube. In

the children, it is manifest by gradual emaciation, nervous irritability and erythema of the buttocks, vulva and thighs. But even if it be digested and absorbed, overnutrition is liable, with excess of carbohydrate consumption to engender glycosuria, if it be coupled with hepatic and pancreatic insufficiency, with excess of protein consumption into peptonuria and albuminuria with hepatic insufficiency under certain pathological conditions. The evil effects of over-nutrition did not escape Charaka. For he says : "If any one accustomed to day-sleep and the comforts of bed ( i. e. does not take sufficient exercise ) indulge in excess of oily, sweet and slimy substances, new rice, new wine, meat, fish, milk, butter, and cakes, he becomes subject to many diseases. If he does not reduce ( the excessive consumption ) of restorative dishes, he will suffer from diabetes ( *prameha* = glycosuria and albuminuria), cutaneous irritation ( *kandu* ), pain ( *gouty* ), eczema ( *kotha* ), jaundice, fever, leprosy, alimentary diseases, strangury ( *mūtrakrucchhra* ), loss of appetite, lassitude ( *tandrā* ), impotence, emaciation, lethargy, heaviness of the body, burdening the circulatory system with waste products, dullness of sense-impressions, mental cloudiness, drowsiness ( *pramilaka* ),

edema (*sotha*), and other diseases." *Charaka* I. 23. 1-5"

## II. MECHANICAL PATHOGENESIS.

*Mechanical (ādhikāra) agents* can be the means of causing bodily suffering and death in various ways under different circumstances. If a man falls from a tree, the injury would depend on the pressure of contact, based on force ( weight, height of the position and the gravitation of the earth, as well as the nature of the ground). Even one can suffer fatal injury, especially to the nervous system, by the rapid vibration of air, as near the passage of a high-speed projectile, of which there have been numerous victims in the recent war and it is known as '*shell-shocks*'. Whatever may be the injury, it is due to the conflict of power and resistance. When one falls from a tree, he is the body in motion : when a sword or a bullet strikes him, he is the resistance. The injury on the wound depends on their mutual relation. One might strike another with a sword, lacking force without causing more than a bruise, but the same

55. ग्रन्थिलिङ्ग नराणा भीतिकीं केचिदापुः

सर्वदहनवीर्ये : शीर्षताकात्य तिष्ठः । चरकस्त्रिता, सूत्रकाण, १६, १—५ ।

sword can cut him in twain, if struck with vigor. The nature of a wound depends on the instrument and the force with which it is struck. With sharp-pointed instruments as the needle, pin, cannula of hypodermic syringe, sting of certain insects and scorpions, any wound is called the '*puncture*' and puncture is usually harmless. Even the heart can be punctured without any serious consequence. Neither is the puncture of the nerve serious, unless the vital centres are penetrated which might cause sudden death. A bruise in the soft parts without a break in the skin is called '*contused wound*' which heals very quickly. A clean cut with a sharp instrument is called the '*incised wound*' and though there is profuse bleeding as long as the incised parts are not tightened together, it heals rapidly usually without infection. Lacerated wounds are those which are inflicted with a blunt instrument or by biting of animals. They generally take a longer time to heal, as it is very hard to keep the torn out tissues in aseptic condition. The seriousness of a gun-shot wound depends on three factors, namely, the point of entrance, the tract and the point of exit. When the bullet has lodged in the tissues of the body, the tract is known as '*blind*'. The wound at the point of entrance is always smaller, due to the

contractibility of the tissue than the aperture of the exit, as it is more subjected to pressure and distension and is consequently more or less lacerated whether the tract of the bullet is direct or tortuous. When a bullet lacks a great velocity, it slants by, if it meets a bone and becomes tortuous, but if it be driven with a great force, it might drill clear through a bone or cause a fracture and impart to the fragments sufficient momentum to act as glancing missiles and aggravate the lesion. The wounds caused by explosives are more serious, as aside from the mechanical effect, the tremendous sudden increase of pressure and temperature, as well as the liberation of toxic gases cause a very severe nerve shock. In any gun-shot or explosive wound, it is the nerve-shock, that is the serious matter. Otherwise in a simple wound not affecting any vital part in the economy, if there is no introduction of any septic matter, and bleeding can be arrested and suppuration prevented, there need not be any fatal consequence.

The physical (*kāla-vala*) agents are many as heat, cold, air-pressure, sudden seasonal changes, dazzling light, the sun (sun-stoke), sound and electricity. It seems that the human organism can stand cold much easier than heat. Of course

with the rising temperature, metabolism is slowed up and the consequence is less oxidation, which means in other words, less production of heat. And there is vaso-dilatation, and the blood rushing to the periphery loses part of its heat by radiation in the surrounding atmosphere, and with the evaporation of perspiration, there is not only further loss of heat, but also a noticeably cooling sensation. However, when the evaporation from the skin is not rapid as in humid heat, it is more unpleasant. The dog or the cat whose body is covered with hairy coating and can not perspire freely, put out their tongue, execute rapid respiratory movements and thus facilitate evaporation through their gustatory organ. But when due to excessive consumption of alcohol, the vaso-motor mechanism does not react, or due to burn, perspiration is interfered with, or in the close overheated chamber near a furnace or boiler, prostration comes with high fever, rapid pulse, stertorous respiration, hot and dry skin and delirium. Perhaps this symptoms-complex is due to the chemical change in the nerves, brought about by excessive heat and not to the coagulation of myosin as it was supposed before. Exposure to the strong sun for a long time, principally the unprotected head, affects the

nervous mechanism directly, especially in one who has not been gradually accustomed to it, by the penetrating actinic rays, creating perhaps molecular changes in the nerve-cells. The prostration is extreme, rapid and sudden, but often the high temperature is missing, though in other ways, the symptoms are those of heat-stroke. Though cold can be better borne than heat, yet after heavy consumption of alcohol, which causes vaso-dilatation and consequently loss of heat, one can be easily frozen to death. The action of cold is intensified by humidity which absorbs a good deal of heat and wind which drives away the warm layer of air surrounding the body. Even a healthy person with prolonged exposure to cold and sudden fall of temperature, might get a frost-bite. The frost-bite is manifest in the first stage by erythema and rubefaction, in the second stage by ulceration and finally by eschars, entailing the loss of the organ. Even when it does not directly cause any lesion, indirectly in a weak, debilitated or undernourished organism, it causes the development of various germs as pneumococci ; or there is an irresistible tendency to sleep from which one hardly wakes ; or the physical and mental apathy may be interrupted by cerebral derange-

ment and delirium, and one dies of heart-failure. The influence of the variations of the atmospheric pressure is not very negligible. At the sea level, the air exerts a pressure of 1.03 kilogramme per square centimeter, that is, about 18,000 kilogrammes for the human body. When a man makes an abrupt ascent to a high altitude in an aeroplane or makes a descent as a sea-diver, the sudden pressure variation is apt to cause various disturbances. At the sea level, at zero altitude, there is a barometric pressure of 76 centimeter of mercury ; in Cashmere at the altitude of 7,000 feet, 56 ; at Mt. Everest at the altitude of 29,000 feet, 24.8. If a deep-sea fish is brought to the surface, it bursts from the expansion of the gas contained in the fish, so a man by a sudden high ascent not only finds it hard to breathe owing to the rarefaction of the air and consequent diminution of oxygen, but also the intestinal gases expand and cause tympanites and the blood rushing towards the periphery provoke diverse disorders from the results of anemia of the internal organs. At the altitude of 2000 meters, the oxygen diminishes 13 per cent ; at 3000, 21 per cent ; at 6500, 43 per cent and at 8500, 50 per cent. To counteract this influence, the aeronauts are supplied with

oxygen tanks, and the deep sea divers with compressed air to two or three atmospheres. The benefit of a mountain resort is in the purity of air and its higher ozone content. But above 11,000 feet, one who is not accustomed to high-mountain climbing, mountaineering may provoke '*mountain sickness*' with a symptom-complex of giddiness, nausea, dyspnea, headache, thirst, malaise and a slight rise of temperature, almost like the sea-sickness, and with weakness of heart may prove fatal. But when a deep-sea diver comes to the surface, he feels a buzzing sensation in the ears, due to the difference of pressure between the two surfaces on the tympanum, and this difference may be sufficiently great to cause rupture of the membrane, and there is a complaint of great fatigue and tendency to fainting. If the reduction of pressure is rapid, there is hemorrhage from the nose, ears and lungs and on the skin in puntiform shape, which the divers designate as '*flea bites*'.

*Light* is visible between 497,000,000,000 and 728,000,000,000 vibrations per second. Below or above this figure, there is no sensory impression. Yet within this narrow limit of our visibility, we can see that light plays an important part in stimulating our nervous system and

general metabolism and killing many of the microbes exposed to it. It is well known how the sun light activates plant growth. Under its influence, carbonic acid—a waste product of the cellular metabolism, is made to unite with water—and thus reconstituting a hydrate of carbon—which is the principal mainstay of energizing food supply of human beings and herbivorous animals. And though light is used very effectively as a valuable therapeutic agent in dermatosis, a strong light might cause erythema and reflected light, either from sand as in the desert or snow, might provoke ophthalmia and blepharitis. The harmful effects of light can be avoided by using blue or black glasses over the eyes, and covering the body, especially the head with black or blue cloth through which the ultra-violet rays can not penetrate and to which the irritation is due.

*Sound* is only audible within the close range of 30 and 30,000 vibrations per second. Prolonged harsh sounds may cause mechanical lesion, even perforation of the timpanum and reflexively nervous irritation. The soothing and restorative effect of the mountains and country places is often in the freedom from noise. And music which is nothing but the harmony of

sound, is now well recognised as an important therapeutic agent for calming and soothing nervous irritation and in various other nervous derangements.

The nature of electricity is not fully understood. Life itself possibly is an electro-chemical reaction, brought about and maintained by the interchange of the intercellular fermentative activities. And the human body is a complicated electrical apparatus : the lungs are the battery and the nerves are the wires insulated with sheaths of medulated and lipoid coatings. If the nerve current propagates at the rate of 120 meters per second only, while electricity at 3000 miles, it is because the nerve is not a homogenous wire, but interrupted by thousands of sympathetic junctions. It is now recognised that the insignificant quantity of minerals in the diet plays a vital role in the economy. It is very likely that they are intimately connected with the generation of electric current. And like vibrations of light and sound waves, the human organism can only adjust within a limited range. Beyond that, it provokes death by molecular change in the nervous system as in electricution. The alternative current of 200 voltage kills a dog within 30 seconds, 700

a horse and about 2000 a human being. This also proves that the human body is a better electrical machinery, withstanding the shocks of 2000 voltage, while the horse though superior to man in body weight and muscular strength, succumbs to shocks of 700 voltage,

*Infectious (daiva-vala) agents* are of various kinds as a sporozoid in malaria (*plasmodium malaria*), a high fungus akin to *streptothrix actinomyces* in tuberculosis (*bacillus tuberculosis*) or a bacterium like *gonococcus* in gonorrhea. It seems that the pathogenic microbic agents are almost ubiquitous. They are in the soil, water and the air. They find themselves upon our skin from all sources. But they usually live there a harmless saprophytic life, as the horny epidermis underlined by a layer of fat offers resistance to their penetration. With each inspiration countless bacteria get admission in the respiratory passage, but they are retained by the hair in the nasal orifices and by the vibratile cilia of the mucous membrane. Those who penetrate farther, are either expelled with the mucous secretions, or by the germicidal mucus they are disinfected and pasted on the walls of the nasal orifices. The microorganism invade in large colonies the alimentary canal with the ingestion of food and drink,

but the hydrochloric acid content of the gastric juice possesses a considerable germicidal power. The intestine unquestionably is a favorable place for their growth, as sufficient humidity, warmth and nutrition from the residue of the food are found ideally combined, and there is hardly any antiseptic secretion there to arrest their development. In the gastric cavity are found nearly 50,000 microbes, in the mouth of duodenum 30,000, in the cecum 25,000 and in the lower intestine about 100,000 per cubic millimeter. On the whole, on the same basis of computation there are about 412,000,000,000 microbes in the whole of the alimentary canal and every day with the feces from 12 to 15 billions are evacuated. That they do not increase usually more than that, is due to the fact that the fermentative bacterial colony counteracts the luxuriant growth of the putrefying germs which cannot flourish in the acid medium and thus they preserve a mutual balance against each other so that they can not easily become obnoxious to the economy. But in case the vegetative microbial flora become active and virulent, they reach the lymphatic glands and the liver, where they are destroyed. Of course the toxins liberated by the pathogenic micro-organism

can be absorbed, but they are more or less attenuated, modified and made innocuous in the hepatic cells and other mechanisms of the body. Though the vulva and vagina swarm with pathogenic germs, infection through the genito-urinary passages is very rare except in venereal diseases as gonorrhœa, soft chancre and syphilis, where even an abrasion, wound or cut is necessary which generally takes place through the sexual congress by the sharp edges of the hair, so that the venereal disease-producing germs can find a safe lodging place to develop in vitality and virulence, as they are partly disinfected by the germicidal mucous secretion and washed away by the force of urination. When the morbific agents as streptococcus are introduced in the vaginal canal, they are all destroyed within forty-eight hours (*Menge*) by the abundant vaginal secretions.

But even when the pathogenic germs force through and invade the economy, the body is not defenceless. When their morbific action is not very virulent, the leucocytes rush up to the locality and destroy them; if complete destruction is not possible for the phagocytes, the lesion is circumscribed by the leucocytes and the exudation. However, if the morbific

invading micro-organisms are very virulent, then of course the leucocytes are repelled by the negative chemotoxic action of their secretory toxins. And then they invade the economy by the lymphatic or venous path. For blood has a considerable germicidal power due to its opsonic content. But even in case the microbes enter by way of the stomach or the intestine and reach the portal vein, they have to pass through the formidable fortresses of the bodily defensive mechanism—the liver and the lungs which exercise a tremendous germicidal action, before they can enter into the left heart to be thrown into the general circulation. And whether the microbes enter into the circulatory system by the portal vein or penetrating through the capillaries, any way in blood they have but short-lived existence, for either they are destroyed or driven into the capillaries, within less than ten to fifteen minutes.

Life is indeed a continuous struggle with the micro-organisms to preserve its integrity. Even when there is a general invasion, the body does not give up the task of self-preservation hopelessly. The body enjoys more or less various immunities—racial, ancestral, seasonal, inoculationary acquired and passive as a natural

reaction of the organism to counteract the toxic products of the disease germs. We know that the Negro races possess a remarkable immunity against *yellow fever* while they are very susceptible to tetanus and tuberculosis. The Mongolian race is very predisposed to small-pox, but not to tuberculosis. It is well known that the offsprings of a gouty family are almost immune against tuberculosis. And syphilis runs in Europe a benign form, which when introduced among savages, rages like an epidemic and exterminates the population. Seasonal preference for diseases is also well marked as the typhoid and the gastro-intestinal diseases in the summer, malaria in the autumn, thoracic disorders in the winter and pneumonia in the spring. It is the Chinese who first noticed about four thousand years ago that certain diseases like the small-pox gave an immunity to its victim against its recurrence. On this principle, vaccination has driven away small-pox practically from all civilized countries. As a prophylaxis against infectious diseases, *serum therapy* is being built up on the same basis, inoculating an animal with the virus and thus gradually attenuating the virus through a few successive animals, a serum can be obtained

which contains enough of antibodies, but not strong enough to cause any malaise, in the human system. The inoculation of the attenuated serum is not only a prophylaxis against the disease, but even when the infection takes place, it stimulates the resisting power of the organism by its bacteriolytic (*lysogenic*), agglutinative and opsonic action. Various sera have been made and tried as that of typhoid, pneumonia, cholera, but yet only the vaccine of small-pox has given completely satisfactory result. But undoubtedly with the improvement of technique and with better knowledge of bio-chemistry and bacteriology, modified bacterial sera promise great results in therapeutics in no distant future.

**Incubation Period of the Infectious Diseases.**

Disease	Microbe	Average	Minimum	Maximum	days
Anthrax	Bacillus anthracis	2 days	1 day	3	
Cholera	Spirillum cholera Asiatic	2 to 4 "	1 "	6	"
Diphtheria	Klebs-Loeffler bacillus	2 "	2 "	15	"
Erysipelas	Streptococcus erysipelatos	4 to 6 "	7 hours	22	"
Gonorrhœa	Gonococcus	3 to 5 "	1 to 2 "	7 to 28 "	
Influenza	Pfeiffer's bacillus	3 to 4 "	1 "	5	"
Malaria	Plasmodium malariae	6 to 10 "	4 "	Several months	
Measles	...	8 to 12 "	4 "	14	days
Plague	Bacillus pestis	1 to 3 "	8 hours	10	"
Small-pox	...	12 "	7 "	15	"
Chicken Pox	...	15 "	14 "	17	"
Syphilis	Treponema pallidum	20 to 30 "	10 "	50	"
Tetanus	Bacillus tetani	2 to 3 "	7 hours	30	"
Typhoid	Bacillus typhosus	14 "	3 "	21	"
Whooping cough	...	8 "	2 "	10	"

All infectious diseases are now ascribed to microbic agents and they have been all identified except in some eruptive fevers as the scarlatina, measles, small-pox, varcella (*chicken pox*) and ere long, it is expected they will be isolated. The parasitic diseases can be classified this way.

Diseases due to pyogenetic micrococci :—  
Suppuration, septicemia, erysipelas and gonorrhea.

Acute diseases due to specific bacilli :—  
Cholera, diphtheria, influenza, meningitis, plague, pneumonia, tetanus, typhoid, yellow-fever.

Chronic diseases due to tissue bacilli :—  
Glanders, leprosy, tuberculosis, mycetoma (*Madura foot*).

Diseases due to protozoa :—Dysentery, filariasis, kala-azar, malaria, sleeping sickness, syphilis.

But the same morbific agent may cause local or general pathogenesis as for example, when pyogenic streptococcus is inoculated subcutaneously, only a local lesion—erysipelas is produced, but when it is injected into the veins, it causes general infection—septicema.

The microbes (*krimi*) in the feces originate in the same way as those in the lymphatics. Their habitat is the intestine. If some of them (*krimi*) travel towards the stomach, then in the breath and in the vomiting, there is bad odor. They

are minute, globular (*micrococci*), white-complexioned, long (rod-like bacteria as that of the anthrax), and like the lamb-hair (*leptothrix*)."  
*Charaka III. 7. 9<sup>6</sup>.*

*Dental caries* : "In this disease the microbes (*krimi*), originating from corrupt blood, blacken, perforate and loosen the teeth." *Susruta II. 16, 27<sup>7</sup>.*

The disease-producing germs are introduced into the system either through the air as tuberculosis, food and drink as in cholera, through soil as in tetanus, personal contact as in gonorrhœa, or through an intermediary as in malaria (*anopheles*). As long as the microbes remain in vegetative state, they simply live as parasites, but sparing the host and doing the least harm to the economy, as they take only the minimum food for their maintenance. It is only when the organism is devitalized due to over-work, fatigue,

56. पुरोषजात्स्वसमूहानाः ज्ञेयज्ञैः । तेषां पक्षाशय एव स्थानम् । प्रवृत्ति-  
 आनास्त्रधी ते विसर्पनि, यस्य पुनरामाशयेन्द्रुखाय स्युः, तदनन्तरं तस्मैङ्गार-  
 विकासाः पुरोषगन्धिनः स्युः । संस्थानवर्ण विशेषास्तु सूक्ष्मडत्तपरौषाङ्गाः चेता दीर्घो-  
 र्क्षा शुष्काशः केचित् । चरकसंहिता, विमानस्थानम्, ७, ८ ।

57. इच्छिद्वी चलः जावी ससंरभो महारजः । अनिमित्तहजो याताविश्वेयः  
 इनिटक्ककः ॥ सुश्रुतसंहिता, निदानस्थानम्, १६, २७ ।

malnutrition, or undernutrition that they become virulent and by their toxic secretion cause functional disturbances and reactions.

Flies deposit microbes in the ulcer and when the ulcer is eaten up by those microbes, (local) edema is produced. *Susruta IV. I. 103<sup>o</sup>.*

*Chemical (biṣa) agents* are many, but they can be divided into two classes as endogenous and exogenous. The endogenous toxins are those that are produced autogenously in the cells as metabolic wastes or engendered by the microbes that live on the body as parasites. The exogenous toxins may be introduced with rotten, poisonous, indigestive or disharmonious combination of food and drink, bites of venomous snakes and insects, occupations in lead, copper, corrosive chemicals, sulphur, arsenic, quick-silver mines or ovens, especially of coke-coals where in addition carbon monoxide may be absorbed

"Toxins are of two kinds : stable (*vegetable and metallic*) and mobile (of animal origin).

Stable toxins are divided into ten classes and the mobile toxins into sixteen classes. Root, leaf, fruit, flower, skin, exudation, juice, extract, 'dhātu' (*chemical principle or metal*) and bulb are the sources of *sthāvara* (*stable*) poisons." *Susruta* V. 2. 2-3<sup>59</sup>.

"Retention of feces and urine (through absorption of their poisonous contents), day-sleep, keeping vigil at night, drinking of liquor, exposure to cold and wind, sexual excess, exposure to foul odor, dust, smoke, wind and the sun, ingestion of ( excessive quantity of ) foods that are hard to digest, acid or vegetables (*sāka*=leaves of plants), drinking of very cold water, receiving a wound in the head, acidity due to indigestion, weeping, retention of tear, cloudy weather, extreme depression, some misfortune to the country and untimely season, derange the nerve, venous and lymphatic systems and vitiate the blood of the brain and

59. स्थावरं जड़मध्ये व विविधं विषसुच्यते ।

इश्वाचिष्ठानमादन्तु वितीयं शोकमाग्रयम् ॥

मूलं पदं फलं पुष्पं त्वक् शोरं सारं एव च ।

जिर्याचो धातुवस्त्रे व कान्द्र दशमः अृतः ॥३

सुशुतस्त्रिता, कल्पस्थान, २, ३-३ ।

thus cause headache with varied symptoms."

*Charaka 1. 17. 4<sup>o</sup>.*

"Foods that are turned into poison by (disharmonious ) combination, are being mentioned..... Do not eat meat or fish with the grains of sprouting rice, fat, honey, milk, molasses or with bean (*māṣa-paseolus radiatus*). Do not take clarified butter, if it has been kept more than ten days in a brass vessel." *Sūśruta 1. 20. 12-13<sup>o</sup>*.

60.

सन्धारणाद्विशास्वशाद्रावै जागरणान्मदात् ।  
 उच्चेर्भाष्यादवश्यायात् प्रागुतादतिन्दुष्टात् ॥  
 गम्भादसात्मगादाद्राताद्वजोधूमानिखातपात् ।  
 गुर्व्यक्षाइरितादानादतिशीतान्मुसेवनात् ॥  
 शिरोभिघाताह दामाद्वोदनाद्वाप्यनियहात् ।  
 मेधागमान्मग्नेयापाहे शकालविपर्ययात् ॥  
 वातादयः प्रकृत्यनि शिरस्यज्ञ दुर्घति ।  
 तदः शिरसि जायन्ते रोगा विविधलक्षणाः ॥  
 चरकसंहिता, भृत्यानम्, १७, ४ ।

61. अतोऽन्यान्वपि संधीगादहितानि वस्त्रानः । न च विद्धधान्यैर्बसामधुपयो-  
 गुणमावैर्वा याम्बाण्पौदकपितितादीन्यव्यवहरेत् । न यदोमधुधा दोहिष्णीशकं जातु-  
 शाकं वाक्त्रीयात् । वलाकां वारुणीकुञ्जावाभ्याम्, काकमाचौ पिप्पलीमरिचाभ्यां,  
 नाडीमहाव्याकाङ्क्षटदधीनि च नैकाध्यम् । मधु चोपोदकागुणानि पिसेन वा मादानि ।  
 सुराकृशरापायसां च नैकाध्यम् । हीवीरकेच सह तिलशङ्कुलेन् । मद्वैः सहित-  
 विकापात् । गुणेन काकमाचौम् । मधुना मूलकम् । गुणेन वाराहं मधुना सह  
 विद्धम् । चीरिच मूलकम् । आमलान्मवद्वाविच्छूकरगोधाव सर्वांच मत्स्यान्

"Poison is not the only toxin; unpurified copper (that has not been incinerated and calcinated) is a terrible poison." *Rasendra-Sāra-samgraha* 1. 136<sup>42</sup>.

"Unpurified sulphur (that has not been incinerated and calcinated) produces fever, eczema, delirium and biliary disorders." *Rasendra-sāra-samgraha* 1. 50<sup>43</sup>.

Purified mercury (that has been incinerated and calcinated) is like real ambrosia, but faulty (i. e. incompletely purified or unpurified) is harmful like venom." *Rasendra-sāra-samgraha* 1. 7<sup>44</sup>.

विशेषं चिलिंचिमं पयसा । कदलीफलं तालफलेन पयसा दधा तक्षेण वा । लकुच-फलं पयसा दधा नापमूपेन वा मधुना घृतेन च, प्राक पयसः पयसोऽन्ते वा ॥१२

अतः कर्म्मविरहान् वस्यामः । कपोतान् सर्वपतेलभृष्टान् नाद्यात् । कपिष्ठल-मयूरसावतिपिण्डिगोधार्षैरण्डार्ज्ञप्रिणिरुद्धा एरण्डतेलसिद्धा वा नाद्यात् । कांसभाजने-दशरावपर्युपितं सर्विः । मधु चांच्छेदणे वा । मत्स्यपरिपचने शङ्खवैरपरिपचने वा सिद्धां काकमार्चाम् । तिलकल्कसिद्धसुपोदिकाशाम् । नारिकेलेन वराहवस्ता-परिभृष्टा बलाकाम् । भासमग्नारथस्य नाशीयादिति ॥

सुशुत्सु'हिता, सूतस्यामम्, २०, १२-१३।

62. न विषं विषभित्याकुलामच विषमुच्यते । रसेन्द्रसारसंयह, १, १३६।

63. अशुद्धगम्बः कुरते तु सापं कुष्ठं खमं पित्तहजां करोति ।

रसेन्द्रसारसंयह, १, ५०।

64. यद्वीज्वमदृतः साचात दोषयुक्तो रसी विषम् ॥ रसेन्द्रसारसंयह, १, ५।

Poisoning might also take place from the ingestion of some fish-eggs at the breeding season, some fish and molluscs which live on putrefied matter, from the cooking earthen vessels that are varnished with substances containing lead, arsenic or vermillion, foods that are colored and flavored with aniline products or preserved with an excessive dose of salicylic acid.

All the snakes are not poisonous however, for though they are provided with a venom gland, all of them do not possess an excretory duct, so that the venom can not be poured out.

But all poisons do not act immediately on the organism. Some poisons especially the metallic ones as arsenic, mercury, lead, sulphur have cumulative effect. Though they may be taken in small doses, they may be accumulated in the liver and the osseous system and after months or even years, they might express in violent reaction of their cumulated effect. But in other poisons as that of morphine, alcohol and tobacco, the harmful reaction ceases more or less after a while when the organism acquires the habit of neutralising the noxious substances of those poisonings. Tobacco not only harms the organism by the partial absorption of nicotine, but also by the inhalation of carbonic acid, carbonic oxide,

sulphuretted hydrogen, hydrocyanic acid and pyridic bases, which the tobacco smoking produces.

According to Charaka (III. 6. 4), the diseases are innumerable, but Suśruta (VI. 66. 6.) calculates them as eleven hundred.

#### IV. DISEASES AND THEIR DIAGNOSIS.

"The physician in order to make a prognosis, must examine by *direct* (*pratyakṣa*), *indirect* (*anumāna*=inference) and *differential diagnosis*, the *color* [ of the skin : lemon yellow tint in pernicious anemia, waxy pallor in nephritis, bronzing in Addison's disease, greenish hue in chlorosis, blue skin (*cyanosis*) in congenital heart disease, brownish-yellow coloration in jaundice, grayish tinge in the long-continued therapeutic ingestion of silver nitrate, yellow tint in cancer and a permanent pallor in malarial cachexia, tuberculosis, leucemia, syphilis, chronic mercurial, lead and arsenic poisoning ], *voice* [ whispering voice (*aphonia*), coarse or harsh quality of the voice that is generally known as 'hoarseness' (*dysphonia*) are due to the inflammation of the larynx, or disease, or pressure upon the recurrent laryngeal nerve; chronic aphonia ( hysterical aphonia is only temporary ) is said

to be prodromal of leprosy and chronic hoarseness that of cancer ; deep, hoarse voice and brassy cough indicate interference with the superior laryngeal nerve and if there is aphonia without cough or dysphonia, it may be due to paralysis of all the laryngeal muscles ; a flat and toneless voice results from one-sided paralysis of a cord and a falsetto voice from paresis of the tensors of the cords ; the open nasal tone is indicative of the paralysis of the soft palate or destruction of the soft palate by ulceration, usually syphilitic or of congenital cleft of the palate, and the closed nasal voice is often suggestive of coryza, hay asthma, hypertrophic rhinitis, nasal polypus, postnasal adenoids, enlarged faucial tonsils, suppurative tonsillitis, acute pharyngitis and retropharyngeal abscess ; the varied forms of aphasia, motor (*aphemia, agraphia*), sensory (*visual, auditory*), conduction, are the symptomatic expressions of the focal cerebral lesion, occurring in the left hemisphere in the right handed and the right hemisphere in the left-handed, but might also occur in cerebral hemorrhage, thrombosis, embolism, abscess, tumor, gumma, depressed fracture of the skull and more rarely in hysteria, neurasthenia and immediately after epileptic convulsion ], *odor*

[ an unpleasant odor of breath is usually present in the mouth of those whose teeth are not cleansed and food particles are allowed to accumulate on them and to cause decomposition and fermentation ; a foul odor in stomatitis and glossitis ; a stale and musty odor with the accumulation of sordes upon the teeth as in typhoid ; caries of the teeth, necrosis of the jaw, pharyngeal or tonsillar diphtheria, follicular tonsilitis and locunar concretions also produce bad odor ; but the most fetid odor attends the mercurial and gangrenous stomatitis and less so scurvy ; in uridrosis occurring with diseases in which the action of the kidney has been impaired, the sweat has a urinous odor, and deposits white scales or crystals of urinary solids upon the skin ; there is volatile fatty emanation from the sebaceous secretion and mixed with perspiration, the odor varies in health and sickness, according to age and race : among the Negroes, it is the most pronounced and in the Mongolian race, it is the least ], *taste* [ a bitter taste is felt in jaundice ; a coppery taste in gastro-duodenal catarrh ( biliaryness ) ; diversified taste sensations as sweetish, sour, foul are felt when the tongue is coated and furred from whatever cause ;

abnormal taste with the long continued use of certain drugs as potassium bromide, iodide or tartar emetic ; perversions of taste in hysteria ; absence of taste (*ageusia*), if it is unilateral is indicative of the disease of the glosso-pharyngeal nerve, and if it is bilateral, of the diseases of the nose as coryza or polypus ; partial impairment of taste (*hemiageusia*) may be due to the facial paralysis, or due to local conditions of the mucous membrane of the tongue, involving the taste buds and end-organs of the gustatory fibers, as in thickly furred or coated tongue, or due to the irritating(as of piperine)or blunting(as of bromides) action of the drugs or condiments ), touch (*sparśa*) comprises tactile sense (*esthesia*), pain sense (*algesic*), temperature sense (*thermesthesia*), muscle sense (*myesthesia*) : the loss of tactile sensibility (*anesthesia*) is indicative of cerebral lesions (*causing hemiplegia*), hysteria, traumatic neuroses, diseases of the spinal cord, especially locomotor ataxia, neuritis and leprosy ; hemianesthesia, the loss of sensibility confined to one side of the body or to lower extremities or of unequal distribution, are mainly due to hysteria ; an excessive sensibility (*hyperesthesia*) is generally met with in hysteria, chiefly in the hystero-genic zones, which are in the breasts and below

them in the central part of the chest, in the pelvic region and the back ; in neurasthenia there are localized hypersensitive tender spots along the spine, scalp and the chest ; in menopause and gouty diathesis, there are also tender points on the scalp ; a general hypersensitiveness may be present in influenza, typhoid fever, and in alcoholic intoxication , disturbances in the heat and cold sensation (*thermaesthesia*) are due to syringomyelia and to a less extent to the lesions of the medulla and locomotor ataxia ; disturbances of the pain sensation—either hyper—or hypo-sensibility are due to syringomyelia, Morvan's disease, hysteria and syphilic chord disease ; loss of muscular sensation is characteristic in locomotor ataxia, paramyoclonus multiplex, myeletic disease, and the lesions in the medulla and the pons ; transference of sensation (*allo-chiria*) so that a touch, on one side of the body is felt on the other, is symptomatic of hysteria, locomotor ataxia, disseminated sclerosis, myeletis; delayed conduction so that a tactile or pain sensation requires 5 seconds or more, instead of one-tenth of a second, is characteristic of locomotor ataxia and peripheral paresis), the eye (edema of the eye-lid, particularly the lower one, is usually symptomatic of renal disease ; morning

puffiness with bloated face is also seen after a night of debauchery or in cases of profound anemia, chlorosis or in neurotic adolescents ; in erysipelas, glanders, severe coryza, hay fever, measles, variola and occasionally in varcella, as well as the prolonged use of arsenic and iodine may induce the swelling of the eye-lids ; ptosis—the dropping of the eye-lid—is either congenital or due to the paralysis of the third nerve ; lagophthalmos—imperfect closure of the lids follows paralysis of the orbicularis muscle, either due to lesions of the portio dura of the facial nerve or leprosy ; blepharospasm—spasmodic closure of the lids is due to the reflex excitability of the fifth nerve in photophobia, in ocular disorders and is symptomatic of meningitis, cerebral tumors, typhus, measles in certain stages of their evolution and may be also present without actual inflammation of the membrane in hysteria and in chorea in children ; hordeolum—a sty or minute boil on the palpebral margin, if small and single may be of local origin or indicative of the over-use of defective eyes or more frequently of digestive or genital disorders ; blepharitis—inflammation of the margin of the lids which become thick, reddened and crusted with cheesy secretions, is indicative of scrofula or

of minute ulceration, resulting from a previous ophthalmia or measles, anemia or in tuberculous diathesis ; verruca—warts upon the eye-lids, are usually found in the old people, indicating the possibility of commencing epithelioma ; syphilic ulceration is generally deeply indurated and accompanies other stigmata of the tertiary stage ; a dusky color of the lids and under the eyes is seen in women during menstruation, in mcnorrhagia, long-continued leucorrhea and early in pregnancy : it may also accompany anemia, loss of sleep and in exhausting diseases ; dark circles round the eyes are symptomatic of the abuses of masturbation ; the yellow color of the sclera of the eye is symptomatic of jaundice ; bluish-white or pearly sclerotic is seen in anemia, phthisis and nephritis ; inflamed conjunctiva is usually caused by gonorrhreal infection, though it may be present in lesser degree in diphtheria, measles, hay fever, coryza and influenza of the catarrhal type ; the eye may be dry and glazed in collapse or the typhoid status ; an increased secretion of the watery fluid of the eye (*lachrymation*) accompanies conjunctivitis, irritation of any kind and in alcoholism : inflammation of the cornea (*keratitis*) is mainly of syphilic origin, while the ulceration of the cornea—a reddened,

painful, photophobic eye may be in relation with exophthalmic goitre ; protrusion of the eye-ball (*exophthalmos*) is symptomatic of exophthalmic goitre and may be also present in lesser degree in spasmodic asthma or other conditions attended by dyspnoea ; recession of the eye-ball or the sinking of the eye-ball into the orbit (*enophthalmos*) may be provoked by any wasting disease as consumption, malaria, cancerous cachexia, by absorbing the cushion of fat of the orbital cavity ; dimness of vision may be provoked by uremia, diabetes, excessive abuse of tobacco, hysteria and migrane ; light appears yellowish in jaundice, and reddish after nervous irritation, fatigue and in wasting diseases), ear (unusually prominent, long or misplaced ears with absence of helix, antihelix, or lobule, are degenerative stigmata ; tophi—small, hard, gritty accretions of chalky masses of sodium urate, seen as nodules in the external ear along the margin or in the depressions, is of gouty diathesis ; a very thin, waxy and bluish ear may indicate general anemia or chlorosis; but a thickened and a deformed ear with the effusion of blood between the cartilages and the perichondrium (*hematoma auris*), is a trophoneurosis of the general

paralytic and the insane ; the flow of pus (*otorrhea*) from the meatus, which is very common among children and often associated with intense pain, due to inflammation of the tympanum (*otitis media*), caused by tonsilitis, influenza or measles, is usually without serious consequences, deafness is indicative of the disease of the tympanum, eustacian tube or the auditory nerve : it can be easily found out by placing a watch at a varying distance from the ear and if its ticking sound is not audible by aerial conduction, and then if the same watch is placed upon the mastoid process and the sound becomes audible by bone conduction, then it clearly indicates that there is no nervous lesion and the deafness is due to local hindrances : the auditory nerve and its cortical center may be affected by syphilis, which is usually the case or by tuberculosis by injuring the nerve endings : quinine, salicylic acid or the salicylates may also provoke temporary deafness by causing labyrinthine hyperemia ; hypersensitivity of hearing (*oxyacoia*) and the buzzing, roaring, hissing sound (*tinnitus aurium*), are due either to nervous irritability or to rhinopharyngeal catarrh, with involvement of the eustacian tube or the middle ear), nose [a coarse

and broad nose is symptomatic of myxedema and cretanism ; a depressed and sunken nose is syphilitic unless there is traumatic fracture of the bone ; a pinched and distorted nose may be due to obstruction of polypus, tumor or adenoid growth ; a chronic redness of the nose with dilated capillaries is indicative of alcoholism, otherwise of chronic digestive disorders or amenorrhœa ; an intense pain in the nose is symptomatic of syphilic lesion and a burning pain, to catarrhal inflammations ; a sensation of dryness is felt in the preliminary stages of coryza ; sneezing—the spasmodic expiration, is due to the direct (presence of any foreign body or the inhalation of irritant substances as pepper, snuff and in the early stage of coryza, mesales, pertussis, hay fever, asthma) or reflex (as in hysteria) irritation of the sensory nerves of the nose ; nasal stenosis—difficulty of breathing through the nose, if acute, is symptomatic of an acute coryza, diphtheria, hay fever or prodromal of typhus fever, glanders and variola, and if chronic, it is either due to the obstruction to lymphoid growths as in children or to congenital syphilis ; ulceration of the mucous membrane is usually a manifestation of tertiary syphilis or tuberculosis and might be followed

by necrosis and caries of the bones : the ulcerated surfaces of syphilitic origin is covered with a dry, greenish crust and the stench of the breath is sickening ; non-offensive, watery discharge from the nose marks the beginning of acute coryza, hay fever, pertussis, measles, typhus fever, catarrhal form of influenza and iodism ; offensive discharge accompanied with greenish-gray crusts and its foul odor imperceptible to the subject, is symptomatic of syphilitic necrosis or of atrophic rhinitis ; a discharge of blood from the nose (*epistaxis*) may have varied causes as alcoholism which renders the vessels to rupture, adenoid growths, ulceration in the nose, suppressed menstruation, chronic nephritis, cerebral thrombosis, and may be prodromal of typhoid or other eruptive fever infection ; loss of sense of smell (*anosmia*) may be due to local obstruction as polipi or adenoid growths, or chronic rhinitis and if it be only temporary, it may be of neurotic origin as hysteria or neurasthenia, and if it be permanent, the olfactory anesthesia may be caused by nasal necrosis of the bone, supporting the tract, or a tumor involving the nerve ; hypersensitivity to smell (*hyperosmia*), hallucinary smell (*parosmia*) and an offensive smell (*kakosmia*)

without any physical basis, are all of neurotic origin], *tongue* [the colour of the tongue, the only mucous membrane of the body, except the oral and the faucial, that is open to naked eye inspection, changes according to health, digestion and especially to the gastric condition to which it is closely related : it is pallid in anemia, bluish in cyanosis, reddish in gastric hyper-acidity, bright-red in the first stage of scarlet fever and in the inflammation of the tongue (*glossitis*), and greyish in nigrities ; a great enlargement of the tongue takes place in acromegaly and myxedema, but the tongue also swells considerably in variola, salivary calculus and in angina Ludovici ; the coating of the tongue consists of the accumulated epithelium, micro-organisms and food detritus : a thin-white coated tongue may be normal among the smokers or those who are accustomed to breathe through the mouth, but it usually accompanies mild gastro-intestinal disorder, nasopharyngeal catarrh or light fevers ; a flabby, swollen, indented tongue, covered with a yellow, pasty fur, is symptomatic of catarrhal gastritis, gastro-duodenitis or febrile conditions ; a narrow tongue with a deep median fissure on each side of which there is a rough, thick, brownish fur, or if it be

dry, red and glazed, is characteristic in typhoid status in its early and late stages ; a covered tongue with white fur through which project swollen and bright-red fungiform papilla, is indicative of measles and other eruptive fevers ; if one side of the tongue is higher than the other, this is due to the unilateral lingual paralysis and associated with hemiplegia ; if the tongue lies motionless in the floor of the mouth and the subject is unable to protrude it and the functions of speech, mastication and deglutition are seriously impaired, it is due to the total lingual paralysis, caused by thrombosis or syphilitic lesion]. skin [ dryness of the skin (*anidrosis*) is observed in cholera, myxedema, diabetes, Bright's disease, dropsy and in the first stage of many acute diseases, attended by high fever ; moist skin and increased perspiration (*hyperidrosis*) occurs in typhoid fever, tuberculosis, trichinosis, tetanus and in rheumatism, but the rheumatic sweat is strong in odor and acid in reaction ; in many acute diseases '*critical sweats*' suddenly break out with the fall of temperature as in pneumonia with the termination of paroxysm as in malaria, or the night sweats of tuberculosis and other wasting diseases ; partial or localized sweating is caused by the deranged innervation of the

vaso-motor nerves and by the local vaso-motor paresis : this is particularly marked in rhachitis and in which disease, which usually occurs among children, the sweat is confined to the head and the patient rolls his head at night and the hair on the back of the head is rubbed off ; sweating of the hands and feet are seen in general debility ; unilateral or one-sided sweating of the head and face may arise from destructive pressure on the sympathetic nerves, causing paralysis of the dilator fibers of the ciliospinal branches, as in thoracic aneurism, suppurative parrotities, migrane, neuralgia ; unilateral sweating of the body (*hemodrosis*) occurs in hemoplegia : eccymosis and petechiae—purple patches caused by extravasation of blood into the skin, appear in many diseases and drug poisonings as in acute yellow atrophy of the liver, pernicious anemia, in advanced stage of cancer of the liver and the stomach, cerebro-spinal meningitis (epidemic), cyanosis, diphtheria, jaundice (in severe forms), old age ( in the extremities ), peliosis rheumatica, pyemia, advanced cirrhosis ( hepatic or renal ), septicema, tuberculosis (with extreme debility), typhoid fevers, ulcerative (malignant) endocarditis, yellow fever, and the rashes may be caused either by idiosyn-

crasy or by poisoning with antipyrine, arnica, arsenic, atropine, belladonna, cannabis indica, capsicum, chloral, copper, croton oil, digitalis, iodine, ergot, lead, mercury, morphine, opium, potassium iodide and bromide, quinine, salicylates, santonine, silver, sulphur, tar, tartar emetic ; inflammatory eruption in cerebro-spinal fever, dengue, glanders (acute), erysipelas, syphilis ; exanthematous eruption in measles, rubella, searlatina, varicella, variola ], *mind* (dullness of mind is seen in cerebral inflammations, scleroses of the brain, and in brain tumors), *concentration of mind, purity* (hygienic conditions), *disposition, behavior, memory* [ memory is impaired (*amnesia*) in paralytic dementia, epilepsy, neurasthenia, the over-use of bromides and in old age], *shape and general configuration of the body* (*ākṛti*--tall, thin subjects with slender ribs, and a long narrow thorax are predisposed to tuberculosis of the lungs ; short, stout, thick-boned persons with florid face are predisposed with sumptuous living to obesity and gouty diathesis), *temperament* (irritability of temper is often associated with gout, rheumatism, jaundice and neurasthenia ; change of temper is seen in pregnancy, typhoid fever, menopause and at the early stage of the exophthalmic goitre ; melan-

choly mood is marked in hepatic lesions), *perversions* (abnormalities of shape result from the following diseases as rachitis, acromegaly, myxedema, pulmonary osteo-arthropathy, osteitis deformans, osteomalacia), *strength, endurance, intelligence, cheerfulness, leanness* (as in consumption), *obesity, lassitude, beginning of the disease, acuteness* (of the disease), *lightness* (of the disease) *physical characteristics, dietary, habits, quantity of food* (that is consumed), *the prevention of the disease* (prophylaxis), *the cure of the disease*, *the preliminary symptoms of the disease, pain* (pain is caused by the lesion of the peripheral, or the central nervous system, or indirectly by affecting the general economy; '*acute pain*' is characteristic of acute inflammations of the serous and synovial membranes as in pleurisy or in joint inflammations; '*dull pain*' is characteristic of the inflammation of the mucous membranes and the parenchymatous viscera; '*paroxysmal*' or *remitting pain*' is characteristic of neuralgias and colics; '*shifting pain*' is characteristic of rheumatism, hysteria, locomotor ataxia, trichinosis; '*gnawing or boring pain*' is characteristic in the diseases of the spinal column, thoracic and abdominal aneurism, periosteal inflammations, gastric carcinoma, and occasionally in gouty and lithemic

lesions ; '*cramp*'—the sudden painful spasm of certain muscles, aside from the occupation cramps from the over-use of fingers as in writer's cramp, whether it is of the calf, toes or the abdomen is usually characteristic of gastro-intestinal diseases and flatulence by causing an excessive tension to the muscular wall of the stomach and the intestine ; diffuse pain as in fever ; pain in the vertex—the crown of the head, is characteristic in neurasthenia, diseases of ovaries, uterus, bladder, epilepsy, hysteria, anemia, chlorosis in the frontal and the temporal region of the head, in nephritis, uremia, eye strain, iritis, glaucoma, dyspepsia, constipation, syphilic nodes, lithemia, rheumatism of the scalp ; in the occipetal and cervical region : spinal irritation, diseases of the cervical vertebrae, dyspepsia, constipation, syphilis (very frequent), uterine lesions, eye strain, carious teeth, nephritis, uremia, cerebellar tumor, meningitis, adenoids of pharynx, naso-pharyngeal diseases, middle ear diseases, rheumatism ; in the parietal region : dysmenorrhea, diseases of ear and bone, cancer of tongue, hysteria, lithemia ; in the eye-balls : ophthalmoplegia interna inflammation of conjunctiva, iris, cornea, coryza, neuralgia of the fifth nerve, asthenopia (eye strain) ; in the nose : acute rhinitis

diphtheria, glanders, primary syphilis ; aural region : otitis media, furuncle of meatus, mastoid abscess, polypus, carous teeth, alveolar abscess, cancer of tongue, aneurism of innominate dentition, temporo-maxillary rheumatism, syphilitic or carous lesion of maxillary or temporal bones ; in the front neck : myalgia, cervical caries or abscess, sprains, inflamed lymph glands, aneurism of innominate ; nape of neck : rheumatism, neurasthenia, laryngitis, cerebrospinal meningitis, tetanus, cervico-occipital neuralgia ; throat: tonsillitis, pharyngitis, scarlatina, diphtheria, cascinoma, laryngitis, irritant poisoning ; jaw : dental affections, salivary calculus, neuralgia of maxillary-nerve, parotitis, actinomycosis ; shoulder : rheumatism, synovitis, diaphragmatic pleurisy, dilated stomach or colon, duodenitis, colitis, neuritis, gallstone colic, hepatic diseases ; sternum : gastric diseases, bronchitis, epidemic influenza, tabes, spinal apoplexy, angina pectoris, mediastinal abscess or tumor; breast : uterine and ovarian lesions, hysteria, menstruation and diseases of mamma ; umbilicus : gallstone, hernia, carcinoma of omentum, tumor or ulcer of stomach ; chest : pleurisy, acute pneumonia, pericarditis, phthisis, mediastinal tumor; hysteria; flatulence, pericarditis ; right hypocondrium gall-stones ( particularly )

hepatic diseases; carcinoma of stomach, pancreas or duodenum ; movable kidney, uremia, pleurisy ; left hypochondrium ; gastritis, colitis, uremia, peritonitis, enlarged spleen ; precordia : functional disorders of heart, endocarditis, thrombosis of pulmonar artery, gout, hysteria, locomotor ataxia, angina pectoris, pyrosis ; Interscapular : flatulence, gastric inflammation or ulcer, rheumatism ; lumbar : lumbago, fatigue, flatulence, appendicitis, hernia, dysmenorrhea, kidney lesions, prostatitis ; epigastrum : gastric lesions, appendicitis, gallstones, ulcer of duodenum, carcinoma of pancreas, cholera asiatica ; uremia, hepato-optosis, enteroptosis ; abdomen : gastralgia, especially hyper-acidity, arsenical, mercurial or lead poisoning, peritonitis, hernia, intestinal tuberculosis, flatulence, tabes, pancreatic lesions, leucemia, dysmenorrhea, diabetes ; right iliac : appendicitis, ovaritis, impacted cecum, colitis hernia, varicocele ; left iliac : colitis, impacted sigmoid, hernia, ovaritis, varicocele ; pubic region : cystitis, uterine or ovarian lesions, ectopic pregnancy, pyelitis, carcinoma of the bladder ; sacral region : uterine, ovarian, or testicular lesions, excessive venery, ulcer of rectum, sciatica ; spine : hysteria, neurasthenia, carcinoma of the liver,

rachitis, scurvy, febrile affectations, spinal curvature, mediastinal tumor; anterior thigh: ovarian or uterine diseases, pregnancy or displaced uterus, dysmenorrhea, renal colic, impacted feces; posterior thigh: sciatica, locomotor ataxia, impacted feces; leg: rheumatism, periorbititis, leucemia, locomotor ataxia, spinal meningitis; calf: cramp due to nephritis, gout, diabetes, hysteria and over exertion; heel: gout, neurasthenia, ovarian lesion, achilodinia; sole of foot: plantar neuralgia, disease of prostate, erythromelalgia; in the articular joints: rheumatism, gonorrhreal arthritis, synovitis, syphilis, tuberculosis, scurvy, neuralgia, pyemia, rachitis; testicle: orchitis, or epididymitis; penis and perinium: vesical calculus, or the passage of the uric acid crystals (gravel), inflammation or ulceration of the bladder, or irritation of the calculus in the ureter or urethra; diffuse pain in the extremities: multiple neuritis, muscular rheumatism, spinal meningitis, influenza, rachitis, trichinosis, *complaints, gracefulness* (of the body), *complexion* (a dull, muddy complexion in hepatic lesion, constipation and digestive troubles), *dreams* (dream as a diagnostic aid has not yet been thoroughly evaluated, as the phenomenon of dream is complex and it is hard to analyze it,

but it is well known that nightmares are usually caused by indigestion, and it is probable that the dream images are formed by the digestive activity, action of the heart and the peripheral impressions or the indirect pressure of the full bladder or impacted feces during sleep, reacting on the central nervous system, awaking the memory centers which for lack of co-ordination, become distorted and fragmentary), messenger's countenance, disturbances on the road, the conditions of the sick-room, medicines, the reactions of the medicines (upon the patient), and advice about the medical prescriptions." Charaka V. I. 1<sup>o</sup>.

*Predispositions* (to diseases) are of six kinds : racial, (Negroes are predisposed to tuberculosis, the Mongolian race to small-pox, Whites to yellow-fever, Jews to diabetes and insanity), ancestral (congenital syphilis, arthritic diathesis), geo-

65. इह छालु वर्ण च स्वरम गम्भेय स्पर्शस चक्षु शोदस ब्रात्स रसनस स्पर्शगम्भेय सूक्ष्म धृतिश श्रीवच्च श्रीलक्ष्माचारस अृतिशाक्तिश प्रकृतिश विहृतिश चक्षु ज्ञानिश मीठा च इवैव दीक्षु चेहर तन्द्रा चारम्भश गौरवस लाधवस गुणशाहारस विहाराशा-हारपरिणामशोपायशापाय व्याधिश व्याधिपूर्वहपव वेदवादशोपद्रवाच छाया च प्रतिश्चाया च सप्तदर्थनस दूतापिकारस पवि चौत्पातिकशाहुरक्षुषे भावावस्थाकरण्यं च निषेध भेदजप्रहस्तिश भेदजाधिकारयुक्तिशेति परीक्ष्याणि प्रव्याप्तानुमानोपदेशरायुः शासादवैष्ट विश्वासमानेन भिजात। चरकसंहिता, उच्चियसानम्, १, ॥

*graphical* (malaria localized in marshy places, where anopheles—a genus of mosquitos—an intermediary of its infection can grow and thrive), *periodical* (epidemics—pneumonia is usually prevalent in the spring, influenza in the winter), *according to age* (there are particular diseases of infancy, youth, middle-age and old-age) and *individual* (idiosyncrasy as susceptibility of certain persons to milk, oysters, strawberries etc, producing eczema, diarrhoea etc.) *Charaka V. I. 3<sup>o</sup>*.

"So the *respiration* (the respiration rate of the newborn is 44 ; at five years, 26 ; in the adult, 16 to 20 ; in health it is faster standing than lying, during the day than at night, after meals than when fasting, in spring than in autumn, and during exercise, emotional and mental excitement than when at rest ; and there is about four pulse beats for one respiration ; rapid respiration is observed in pulmonary lesions, in lobar pneumonia and also in fever, especially in children by the indirect influence of the heated blood on the medulla ; slow respiration is observed in coma, collapse and poising with

66. तद प्रकृतिर्जातिप्रस्तावा तुलप्रस्तावा च देशानुपातिनी च कालानुपातिनी च  
ब्रूयोन्युपातिनी च प्रत्याक्षमियता चेति । चरकस्त्रिता, इन्द्रियस्थानम् १, १ ॥

opium, chloral, chloroform or antimony ; jerking inspiration is indicative of asthma, hysteria, hydrophobia ; jerking expiration in acute pleurisy and fractured rib ; stertorous respiration (snoring) is observed in apoplectic, uremic, diabetic coma, narcotic poisoning and paralysis of the soft palate, aside it is also observed in otherwise healthy individuals, especially children who have adenoids or enlarged tonsils and in grown-ups who are very tired and consequently there is muscular relaxation or are accustomed to mouth breathing, for the snoring sound arises from the vibration from the soft palate when breathing from the mouth and the nose at the same time ; stridulous or harsh respiration is due to some obstruction of the air passage through the larynx, caused through tumor, inflammation or any foreign body; wavy or uneven respiration is symptomatic of pneumonia) ; neck ( a long, scrawny neck with projecting larynx is indicative of tuberculous diathesis and is usually correlated with the phthisinoid chest, while a short and thick neck with apoplectic predisposition ; rigidity of the neck, if chronic, may arise from the lesion of the cervical vertebrae, caused by syphilic necrosis, arthritis or the affection of the cervical muscles by rheumatism and if acute, through the inflam-

mations of cervical glands, tumors or boils interfering with movements of the neck ; nodes upon the clavical bones, resembling the callus, but not caused by trauma, indicate tertiary syphilitic lesion ; but tumefaction above the clavicles occur in amphysema and myxedema ; temporary swelling of the thyroid takes place during menstruation, or after sexual union, especially in women after first connubial embrace ; but a chronic enlargement is generally symptomatic of exophthalmic goitre, but may be also due to adenoma, cancer, tuberculosis or gumma of the gland : an atrophied and depressed thyroid is observed in myxedema and cretinism ; tenderness of the neck may be caused by the inflammation of the lymphatic glands of the region from any cause as cervico-occipital neuralgia, cervical myalgia or cervical caries), teeth (a baby should have six teeth when one year old, twelve when a year and half old, sixteen when two years old, twenty when two and half years old ; milk teeth : 2 lower central incisors appear between six to nine months ; 4 upper incisors between eight to twelve months ; 2 lower lateral incisors and 4 anterior molars between twelve to fifteen months ; 4 canines between eighteen to twenty-four months ; four

posterior molars between twenty-four to thirty months ; permanent teeth : 6 first molars appear between six and seven years ; 8 incisors between eight to nine years ; 8 bicuspid ( *premolars* ) between 9 to 11 years ; 4 canines between 11 to 14 years ; 2 second molars between 12 to 15 years ; 4 third molars between 17 to 25 years ; premature eruption of teeth is indicative of congenital syphilis or tubercular diathesis while delayed dentition that of rachitis or cretinism ; if the permanent upper central incisors are dwarfed, narrowed, short, peg-like or somewhat rounded, tapering from gum to edge, with a single, shallow and discolored notch in the edge, it is a sure sign of congenital syphilis, especially if it be associated with keratitis and middle-ear disease ; dentated or furrowed teeth originate from malnutrition or an acute illness during infancy, sufficiently severe to interfere with the nutrition ; loosening of the teeth in their sockets is associated with the ulcerated, spongy or bleeding gums and therefore it can be ascribed to mercurial or gangrenous stomatitis, pyorrhea alveolaris, scurvy or phosphorus poisoning ; a collection of sticky, dark-brown paste ( *sordes* ) upon the teeth, gums and the lips, sometimes stained with blood

oozing from the gums, is very often present in typhoid and other low fevers; gritting or grinding of the teeth among the children is usually associated with gastro-intestinal disorders; erosion of the teeth takes place in gouty subjects, with loss of polish of the labial surface, followed by grooves which extend into the gums, causing inflammation, necrosis, formation of calculi (*tartar*), loosening of the teeth and pyorrhea alveolaris; early, excessive or rapid dental caries may be due to rachitis, but also takes place in pregnancy, diabetes or chronic phosphorus poisoning; dyspepsia, chronic gastritis, constipation, diarrhoea, persistent aural, nasal, ophthalmic affections, nervous irritability, neuralgias or migraines may be easily caused by the carious teeth or pus sockets by the absorption of the toxin and the ingestion of microbes with the mastication of food), liver and the spleen (*pakṣa* = sides : the liver is the largest gland of the body and lies beneath the diaphragm in the right hypochondrium and the upper part of the epigastrium, about the size of 3 by 5 inches and weighing between two and half to three and half pounds ; enlargement of the liver which can be felt through palpation, occur in chronic malaria, hypertrophic cirrhosis, leucemia, hydatids, fatty

infiltration, abscess, tumor, gummata or cancer ; progressive lessening (*atrophy*) of the liver takes place in cirrhosis ; displacement of the liver upward may be due to pressure from below by large abdominal tumors, meteorism or ascites, and by downward pressure on the diaphragm by emphysema, spasmotic asthma, large right pleural effusion, large intrathoracic tumor, a dilated heart or a pericardial effusion ; abnormal rough, hard and resistant surface is indicative of cirrhosis, carcinoma, amyloid or syphilitic lesion : the *spleen* is of oval, flattened shape and lies in the left hypocondriac region between the stomach and the diaphragm, of almost the same size as the liver ; the rapid enlargement of the spleen takes place in any acute infection, as in typhoid, malaria and other fevers, tuberculosis, small pox, diphtheria, pneumonia, cerebro-spinal meningitis, puerperal or general scepticemia ; chronic enlargement of the spleen occurs in pernicious malaria, in splenic anemia, hepatic cirrhosis ), *eyes*, *hairs*, [*kesā*=long hairs as of the head and the beard ; *loma*=small and fine hairs of the other parts of the body : the hair is luxuriant, bright, oily and wavy in hypersecretion of thyroid as in Grave's, Basedow's diseases and the hair is dry, coarse, stiff and

sparse in hypo-secretion of the thyroid as in myxedema, cretinism ; early gray hair before forty is usually associated with the premature arterial degeneration (*endarteritis*) but it is said that the sudden loss of pigmentation of the hair may take place at times under the influence of terrible fright, anxiety or deep emotion ; tendency to premature grayness of the hair may be hereditary ; circumscribed grey patches of hair may be due to trophic changes brought about by the lesion of the fifth nerve and its branches ; undue and rapid loss of hair (*alopecia*) is indicative of syphilitic lesion, but this must not be confounded with the excessive falling out of hair which takes place during convalescence from acute diseases, as typhoid, malaria, nor with that following an attack of gout or erysipelas, for in syphilis the hair can be easily pulled in large masses without causing pain and the hair does not usually reappear ; in anemia, phthisis pulmonalis, myxedema, hydrocephalus, and the severe neuralgias of the fifth nerve, the hair is usually thinned ; premature loss of hair may be a hereditary family trait], *abdomen* [by inspection, palpation, percussion and auscultation, abdomen can be utilized of a great diagnostic

value : smooth, shining and stretched skin (in the abdomen) is observed in abdominal distension ; whitish stricks or striae are indicative of previous long-continued distension as in ascites, fat or pregnancy, and in extreme case, the whitish stricks (*lineae albicantes*) may be observed also on the buttocks and the upper portions of the thigh ; copper-colored, scaly, somewhat circular spots upon the abdomen are indicative of secondary syphilis, as well as the brownish or yellowish macular areas of cloasma, which may be also present ; enlarged glands in the groins signify either venereal infection or bubonic plague and their retracted cicatrices of their past lesions ; enlarged superficial abdominal veins, radiating from the umbilicus, appear in portal obstruction, through hepatic cirrhosis or tumor, ascites of long duration or greatly dilated stomach ; the navel (*umbilicus*) is deeply retracted in stout people ; if projecting it may be due to portal obstruction, pregnancy or hernia ; it is flattened or protruding in excessive ascites, or abdominal distentions ; fixation of the umbilicus is significant of hepatic malignant cancer ; the abdominal wall may be thick from the deposit of fat or edema and if it be thin with shrivelled skin, it may be due either to old age, wasting disease,

repeated pregnancies or as a reaction of long-standing distension from ascites ; the abdomen may be distended by the accumulation of fat in the abdominal wall, or fluid in the peritoneal cavity or gas in the alimentary canal or the presence of a large tumor ; swelling in the gastric area may be due to tumor, abscess or cancer on the gastric wall, hepatic cancer or pancreatic cyst or sclerosis or the distension of the gall-bladder either with concretions or pus ; swelling in the hepatic area may be due to tumor, cancer, hypertrophic cirrhosis, hydatid cyst or passive congestion of the liver or sympathetically from the distended gall-bladder stuffed with concretions and pus ; swelling in the splenic area may be due to movable or prolapsed spleen, perinephritic abscess, or congested movable kidney, or cancer of the stomach ; the swelling of the appendical area is symptomatic of acute appendicitis ; swelling in the pelvic area may be due to distended bladder, or by the distended uterus by tumor or detained menstrual fluid (*imperforate hymen*) ; swelling in the sigmoid area may be due to the impaction of feces, tuberculous or cancerous peritonitis, ulcer of colon, ovarian tumor or cyst of broad ligament], *nails* (curving of the nails with clubbed fingers, occur only in chronic diseases as phthisis

emphysema, aneurism or chronic cardiac diseases ; malformation, fragility, dryness or cracking of the nails may be due to injury, syphilis or due to trophic defects, resulting from nerve lesion, neuritis, syringomyelia or pulmonary osteo-arthropathy ; arrested growth of nails may be due to hemiplegia from cerebral apoplexy or acute infantile paralysis ; enlargement of the nails with thickening and sometimes twisting occurs in the course of syphilis, sclerodactyly and typhoid fevers ; the nails in some cases of Raynaud's disease, become dry, scaly and cracked or hypertrophied ; ecchymoses and ulcers at the bases of the nails may be due to chloral habit, but in a child (*onychia*) to syphilis or scrofulous diathesis ; white marks or transverse grooves on the surface of the nails may indicate, unless due to injury, the period of recovery from a recent acute illness ; the growth of the nail from the matrix to the end requires about six months and as the white marks develop at the root of the nail and with the growth of the nail, the transverse grooves also ascend higher and so a rough estimate can be made from their position of the time that has elapsed since the convalescence set in ; hard, brittle, and longitudinally striated

nails are observed in gouty subjects). finger (distorted fingers are due to gout, arthritis deformans and less frequently to chronic rheumatism; hard, white, glissening masses (*tophi*) may be present in the joints or along the tendons, on account of the accumulation of the sodium urate in gout and consequently in gout and rheumatism, the joints of the fingers are enlarged and painful, the tophi is more prominent on the dorsal surface of the joints and it sometimes breaks through the skin, so that the chalk-like concretion exudes; knobby enlargements of the proximal ends of the terminal phalanges (end-joint arthritic nodes) may be due either to gout or arthritis deformans and small crab-eye cysts may be formed over the nodes; the tips of the fingers may be bulbous or club-shaped in chronic lung diseases as phthisis or chronic heart affection; the claw hand occurs in consequence of atrophy and paralysis of the interossei and lumbrical muscles due to neuritis of the median and ulnar nerves; the spade hand with large, coarse, thick fingers and broad nails is observed in myxedema, but in which only the soft parts are affected, while in acromegaly, the bones are enlarged; the hand of the individual of a nervous temperament is firm, fine, delicate and

dexterous ; of sanguine temperament, broad, heavy, strong and energetic ; of phlegmatic temperament soft and clammy ; coldness of the hands and feet, with or without tendency to sweating, if persisting for a long time, is due to neurasthenia, anemia, chronic digestive disorders, gout, cardiac or pulmonary diseases, interfering with the circulation) should be observed."

*Charaka V. 3. 5<sup>o</sup>.*

"When he does that (vomits), the physician should examine the expectorated matter from the spittoon with attention." *Charaka I. 15. 16<sup>o</sup>.*

Urine was examined for its color, consistence, taste and smell, only in genito-urinary diseases (*Charaka II. 4* ; *Susruta II. 6*) but sputum, feces and semen as a vitality test and as a prognosis in diseases : "According to the sayings of the wise, his life is at an end, whose sputum, feces and semen sink, when thrown into water." *Charaka V. 9. 14<sup>o</sup>.* *Susruta* gives elaborate details of the prognostic symptoms :—

67. तथासोऽकासमव्यादत्पचाच्चुःकेशलोभोदरगुहाहुँसौऽप्त लक्षयेत् । चरक-  
संहिता, इन्द्रियस्थानम् ५ ।

68. ततोऽस विगान् प्रतियाहगतानवेचित । चरकसंहिता, सूदस्थानम्, १५ च: ॥

69. निष्ठुरूपच्च पुरोषच्च रेतस्याभसि भवति ।

यस्तस्यामुपः प्रातस्मान्माहुँर्जापिष्ठः ॥

चरकसंहिता, इन्द्रियस्थानम्, १ ॥

"He whose *complexion* is changed into pale-brownish (in Addison's disease), reddish (hypere-mia ; chlorosis rubra), yellowish (jaundice or icterus) or blue-purplish (cyanosis), he is near his death. He who suddenly loses his modesty, beautiful appearance, ability to hold himself upright and personal charms (in apoplexy, a sudden loss of consciousness is followed by paralysis, due to cerebral hemorrhage or blocking of an artery of the brain by an embolus or thrombus), he can be regarded as dead. Whose *lower lip* hangs down (the lips are loose and pendulous in diphtheritic paralysis or chronic bulbar palsy), *upper lip* twitches up (twitching or trembling of the lips is index of general paralysis or bulbar palsy), or both the lips have the colour of ripe plums (the colour of the ripe plum is dark bluish, that is cyanotic : in diseases of the heart or the lungs, especially the chronic forms, owing to dyspnœa, the lips are open, dry and cyanosed), his life is hard to save. He whose *teeth* are reddish (stained with blood—*sordes*—in typhoid prostration), or pale brownish (stained from the deposit of foul matter in jaundice on the tongue), or like polished collyrium (dark black deposit is found on the tongue in Addison's disease or *nigritis*), or have fallen (loosening of the teeth in their

sockets may be due to pyorrhea alveolaris, scurvy, purpura hemorrhagia, and extensive and rapid dental caries is common in diabetes or rachitis ), can be regarded as dead. He whose tongue is black ( in Addison's disease or nigrites) paralyzed ( in basal meningitis, syphilitic lesion, tumor or cerebral hemorrhage ), swollen ( glossitis may occur in various diseases as variola, erysipelas or sceptimia ), or dry and fissured ( in the typhoid status ), is near his death." *Susruta I. 31. 2-6°.*

He whose hair looks oily (in hyperthyroidism), though not smeared with oil, does not live long,

70.

यावा लोहितिका नीला पीतिका वापि मानवम् ।  
 अभिद्रवन्ति य शायाः स परासुरसंशयम् ॥२  
 औरपकामते यस्य प्रभावृतिभृतित्रियः ।  
 अकाकाद्यं भजन्ते वा स परासुरसंशयम् ॥३  
 यस्याहृषीषः पतितः चिप्पत्वोऽस्तु तथोत्तरः ।  
 उभौ वा जाग्वद्वाभासी दुर्लभं तस्य औवितम् ॥४  
 आरता दशगा यस्य यावा वा सुरः पतन्ति च ।  
 अद्वानप्रतिमा वापि तं गतायुवमादिशीत् ॥५  
 छाया याख्यावलिमा वा किञ्चां शृणा च यस्य चै ।  
 कर्काया वा भवेद्यस्य सोऽचिरादिजात्यस्त् ॥६  
 सुनुतसंहिता, सूक्ष्मानम्, ११-२-६ ।

and knowing this, the wise ( physician ) should give him up. *Charaka V. 8. 7'*.

Susruta says<sup>12</sup>. "Nervous diseases, 'prameha' ( diabetes and gonorrhea ), leprosy, hemorrhoids ( piles ), anal fistula, calculus, 'mudhagarbha' ( transverse or scapulo-posterior presentation of the fetus during birth ) and abdominal maladies—these eight are naturally hard to cure ; but if these are also complicated with the developments of enervation, emaciation, dyspnea, thirst, 'soṣa' ( desiccation of the body or pulmonary consumption ), vomiting, fever, unconsciousness, diarrhea, hiccup and other complications, then the wise physician, desirous of success, should not undertake their treatment. If

71. यस केशा निरभाषा दृश्यन्ते इयकासङ्गिभाः ।  
उपरुद्धायुषं आला तं धीरः परिवर्ज्यथेत् ॥  
चरकसंहिता, इन्द्रियस्थानम्. ८ ॥

72. व्यातव्याधिः प्रमेहस्य कुष्ठमर्णो भगव्दरः ।  
अग्नर्णी सूदगर्भं च तथैवोदरमष्टमम् ॥  
अटावेते प्रक्षाल्येव इतिकित्स्या महागदा ॥ १  
प्राणानां सञ्चयस्थार-ट्याशोषवमिज्वरेः ।  
मूर्ख्यां तिचारहिक्काभिः पुनर्ज्वैतैरुपद्रुताः ।  
वर्ज्यगोया विशेषेष भिषजा सिद्धिमिच्छता ॥ ४  
शरं सुहस्तवचं भर्तुं कल्पाभानलियौकितम् ।  
नरं रुग्गाति नराच वातव्याधिर्विज्ञाशयेत् ॥ ५  
यथोक्तीपद्वाविष्टमतिप्रजुतमिव वा ।  
पिङ्ककायीकिं गाढं प्रसीडो हस्ति मानवम् ॥

in nervous diseases, there are complications of edema, insensibility to touch, paralysis of the body, tremor, tumor and pain in the abdomen, the patient dies. If in urinary diseases these complications develop, and with the urine much substances (*albuminuria*) are discharged and boils appear on the body, that patient dies. In leprosy, if the nodules ulcerate, eyes become red, the voice broken and the five kinds of treatment as vomiting and purgation do not succeed, the death of the patient is near. In hemorrhoids ( piles ), if there are complication of polydipsia, loss of appetite, pain, excessive

प्रभिन्नं प्रस्तु तारुच रक्षणेत् इत्यरम् ।  
 पञ्चकर्णगुणातीतं कुड़ इन्द्रीयं कुषिणम् ॥७  
 दण्डारोचकश्चलात्मनिप्रस्तु तथोषितम् ।  
 शोफातोसारसंयुक्तमर्थीव्याधिर्विनाशयेत् ॥८  
 बातमूवपुरोषाणि क्रिमयः शुक्रमीव च ।  
 भगवन्दरात् प्रस्तवनि यस्तं परिवर्ज्यथेत् ॥९  
 प्रश्लग्नाभिष्ठवणं कंखमूदं रुग्नितम् ।  
 अस्मरो चपथयाग्नु सिकताश्चकरान्विता ॥१०  
 गर्भकोषपरासङ्गो मङ्गलो योगिसुङ्गतिः ।  
 हनुगः स्त्रियं सूर्यगर्भं यथोक्तासापुरपद्रवाः ॥११  
 पात्रं भग्नाद्रिवहे ष-शोफातिभारपीडितम् ।  
 विरिक्तं पूर्व्यमाणस्त्र वर्जयेदुदराहिं तम् ॥१२  
 यस्ताम्यति विस्त्रज्ज्ञ श्रेते निपतितोऽपि वा ।  
 शीताहिं तोऽन्तरुण्यं चरेण विषयते नरः ॥१३

bleeding, edema and diarrhoea, the patient dies. The anal fistula through which the intestinal gas, urine, feces, microbes and semen are discharged is deadly. In the diseases of hard calculus (*asmarī*), soft calculus (*sarkarā*) and gravel (*sikatā*-uric acid sands), if there appear edema in umbilical region, testicles, ischuria (retention of urine), and shooting pain, the patient dies quickly. In the transverse presentation, if there is paralysis of the uterus, dull pain (*makkalla*) and spasmic contraction of the vagina, the gravida dies. In abdominal diseases, if there is deplegia, aversion for food, edema, diarrhea and inspite of purgation, the intestine remains inflated, then give up

यो छटरीमा रक्ताचो हृदि सङ्कातश्लवान् ।

नित्यं वक्षे च चोच्छुस्यात् तं ज्वरो हन्ति मानवम् ॥१४

हिङ्गाश्वासपिपासार्तं मूढं विभान्तलोचनम् ।

समतोच्छुस्यिनं चोणं नरं चपयति ज्वरः ॥१५

आविलाच्चं प्रताम्यन्तं निद्रायुक्तमतीव च ।

चीणशोणितमांसस्य नरं चपयति ज्वरः ॥१६

आसश्लेषिपासार्तं चोणं ज्वरनिषीडितम् ।

विशेषेण नरं हङ्गमतोमारो विनाशयेत् ॥१७

शुक्राखमद्रव्ये द्वारमूर्जवासनिषीडितम् ।

क्लेञ्चे ण वहु निहत्तं यथा इन्द्राह मानवम् ॥१८

आसश्लेषिपासार्तविद्वे यग्नियमूढताः ।

भवन्ति दुर्ब्धे खलञ्च गुलिनो व्यत्युप्तिष्ठतः ॥१९

(treatment). In fevers, if the patient is delirious, unconscious, and is absolutely confined to bed, and while the outside of his body (skin) is cold and inside (in the internal organs) there is hyperaemia, then he dies. In fevers, if there is horripilation, eyes become red, there is an acute shooting pain in the heart, and respiration takes place only through the mouth, the patient is killed by the disease. And in fever, if the patient has hiccup, dyspnea, polydipsia, delirium and wandering eyes, he goes to the abode of death. In fever, if the patient has clouded vision, delirium, paroxysmal somnolence, hydremia (thinness of blood) and emaciation, the fever kills the patient. In diarrhea, if there are the complications of dyspnea, pain, polydipsia, enervation, emaciation and fever, the aged patient never lives, though an infant once in a while might survive. In phthisis, if the patient has glazed eyes, aversion for food, jerky respiration, and hyperalgia in seminal discharge (in prostatic calculus), any of these complications is to be regard-

आस्तां वृक्षिष्टान् वह्निःहिक्षादङ्गितम् ।

वजाशाससमाविष्टं विद्विनांशयेन्नरम् ॥१०॥

पार्षुदन्तनखो यथ पार्षु नेत्रय मानवः ।

पार्षु सङ्खातदर्थो च पार्षु रोगी विलभति ॥११॥

ed critical. In abdominal tumor, if the patient has dyspnea, pain, polydipsia, anorexia, rupture of the tumor and enervation, death takes place. In a deep-seated abscess (*vidradhi*), if there is abdominal tumescence, anuria, vomiting, hiccup, polydipsia, throbbing pain and dyspnea, he does not live. In icterus (jaundice), the patient dies if his teeth, nails and eyes turn yellowish, and he sees everything yellowish. In gastrorrhagia (hemorrhage from the stomach), if the patient repeatedly vomits blood, his eyes become reddish and he sees everything reddish, he perishes."

*Susruta I.* 33. 3-22.

Pains : " *Boring* (*todana* - as caused by the penetration of sewing needle ), *terebrant* (*vedana* = to tear out ) *lacerating* (*tādana* = concussion as a blow from a rod ), *lancinating* (*chhedana* = cutting with a sharp instrument ), *dilating* (*āyamana*-radiating ), *tensive* (*manthana* - as fire is made by friction of two sticks), *expulsive* (*vikṣepaṇa* = to throw out ), *sucking* (*chumuchumāyana* - as a magnet or mustard poultice draws by suction), *burning* (*nirdahana* =

लोहितं छर्येद् यथ बहुयो लोहितेच्छः ।

रक्तागार्व दिशा इत्था रक्तपितो विनाशति ॥१२

burning), *grinding* (*avabhañjana* = pulverizing), *fulgurant* (*spohtana* = bursting), *shooting* (*vidārana* = penetrating), *evulsive* (*utpātana* = to pull up), *throbbing* (*kampana* = tremulous), *dull, sharp, acute, itching, irritant, premonitory* or *after pain* (*vividha-sūla-viśleṣaṇa* = various degrees of pain), *shifting* (*vikirāṇa* = which shifts from place to place as in hysteria), *cramp* or *spasmodic* (*pūraṇa* = which fills up), *paralyzing* (*stambhana* = which causes insensibility in the adjacent area), *wringing* (*avakuñchana* = to press out), *formication* or *itching* (*aṅkusika* = sprouting, a sensation as of ants or similar objects crawling over the body). By the derangement of nerves, these pains manifest in the '*vranas*' (abscess, tumor, pustule, boil, carcinoma, eczema, etc.) and if for any reason without (apparent) cause, different kinds of pain appear, or in certain localities they appear repeatedly, they are to be ascribed to nervous origin.

Unilateral eruption (*osa*), cutaneous inflammation (*chosā*), diffuse eruption (*paridūha*), oppressed feeling (*dhūmāyana* = as in smoke suffocation), the sensation as if burning coal were spread over the body with the increase of the subjective sensation of heat, and the similar sensation that is felt if a caustic were applied to

a wound,—the pains experienced in these sensations, are of 'pitta' origin ; pains of the abscesses, originating from the vitiation or poisoning of the blood, are the same.

Pruritus (*kandū*=itching), heaviness (*gurutva*=heaviness or weight is felt in the chest in hemoptysis, spasmodic asthma, chronic gastritis ; in the head in neurasthenia, hypocondrisis and is occasionally a premonitory symptom of apoplexy ; in the abdomen or pelvis, due to tumors in those regions ), somnolence (*suptalva*), tumescence (*upadeha*), numbness (*alpa-redana*=partial anesthesia), paresis (*stambha*) and chilliness (*saitya*) are of phlegmatic origin." *Suśruta I.* 22. 9<sup>73</sup>.

"The physician should examine first *vitality* (*āyu*=durability of life) of the patient. Even if there is (good) vitality (signs of long life, manifest in the physical organs), *malady*

73. तोदनभेदनताडनक्षे दनायमनविद्येपण्चुसुन्मायननिहृहनावभज्जनस्तोटन-  
विदारणीत्पाटनकम्भनविविधश्लविशेषणविकिरणपूरणस्थनस्प्रादकुच्छनाहुषिका: सम्भ-  
वनि। अनिमित्तविविधवेदनाप्रादुर्भावो वा सुहुम्मुहुर्यवाग्वच्छनि वेदनाविशेषाक्षं  
वातिकमिति विद्यात्। ओषधोषपरिदाहधूमायनानि यथ नादनः आवकीर्णमित्य  
प्रथमे यथ चोषाभिहस्ति; चतुर्थावस्त्रिकावद वेदनाविशेषाक्षं दैत्यिकमिति विद्यात्।  
पित्तावद्वासमुर्थं जानीयात्। काष्ठुर्गुरुल्लुमलस्त्रुपदेहोऽल्पवेदनत्वं सम्भः शैत्यवद यथ  
तं द्वैषिकमिति विद्यात्। सुश्रुतसंहिता, स्वस्यानम्, २९, ८।

(etiology and the nature of the pathological manifestation), *season* (of the year in its relation to the disease and its reaction against it), *metabolism* (of the patient; *agni*=internal combustion, that is oxidation), *age*, *physical strength*, *nervous vitality*, *predispositions*, *characteristics* (of the patient), *remedies* (available and their reaction against the disease) and *the region* (*dēśa*: marshy or dry, altitude, low or high land, plain or hilly, salubrity of the climate, prevalence of endemic diseases and of epidemics within the territory).

*Signs of longevity* : He enjoys long life, who has large hands, feet, sides, back, nipple (papilla mamma), teeth, face, shoulder and forehead; long phalanx, breath (or respiratory organ), eyes and arms; wide brows, precordial region (*stanāntara*=the space between the two nipples), and breast; short crus (*jaṅghā*=the leg, especially the segment between the knee and the ankle), penis and neck; deep breath (or spiritual force), voice and umbilicus; the mamma not high but firm; fleshy, large and hairy ears; ..... whose joints, veins (vessels) and tendons are hidden, all the bodily parts are healthy and strong, all the senses are steady, and the health has persistently improved, that person will have

a long life. He who has never had any sickness from birth and whose body, intelligence and comprehension have progressively been developed, will enjoy a long life. *Suśruta I.* 35. 2-4<sup>74</sup>.

"Life is (divided) into three periods : infancy, middle-age and senility. Of them, childhood is up to fifteen years ( one minus sixteen ), divided ( further into three sub-divisions ) as sustaining on milk ( liquid nourishment ), milk mixed with other nourishing substances ( in liquid or semi-solid form as barley concoction ) and ( solid ) nourishment. A baby up to one year old sustains on milk, up to two years, milk mixed with other substances, and above two years on ( solid )

74. आतुरस्तपकममादेन भिवजायुरादावेव परीचितव्यम् । सत्यप्यायुषि व्याघ्र-  
लघिवयोदैहवलसस्वसाम्बाप्ततिभेषजदेशान् परीक्षेत ॥ २

तत्र महापाणिपादपादं-पृष्ठ-सनात-दशन-बदन-सन्ध्य-लक्षणाट् दीवांङ् लिपव्यौ-  
खूसप्रेचणावाहुं विसोर्ध्वं अस्त्राकारोरलां ऋक्षजह्नामेऽयोऽवं गभोरस्तस्त्वरनाभि-  
मनुर्वेवदसानसुपचितमहारीमशकर्णं पशान्विकां ज्ञातानुलितं सूक्ष्मांशुपूर्व्या विश्व-  
माशश्त्रोरं पशाच विशुद्धमाणहृदयं पुरुषं जानीयाद्वीर्षायुः खस्यमिति ।

गृदस्त्विशिराद्यायुः संहताऽः स्त्रिरेन्द्रियः ।

उत्तरोत्तरसुवैवो यः स दीर्घायुहस्ते ॥

गभांत् प्रभृत्यरोगो यः शर्णैः समुपचीयते ।

शरीरज्ञानविज्ञानैः स दीर्घायुः समाप्तः ॥ ४

सुशुतस्त्विता, सुवल्लाम्, ३५, २-३ ।

food. From sixteen up to seventy years of age, is regarded as the middle-age : middle-age is composed of four periods as *pubescence* (*vrddhi* =growth), *adolescence* (*yauvana*=youth), *adulthood* (*sampurnata*=completion of growth), *senescence* (*hāni*=declining period) ; up to the age of twenty, is the period of growth, up to thirty—youth, up to forty full development or maturity, and from forty to seventy, it slowly and gradually declines. (The skeleton reaches its limit very nearly at the same time as the whole frame reaches its maximum of height, the coalescence of various epiphyses being completed by about the twenty-fifth year. Similarly the muscular system in its increase tallies with the weight of the whole body. The brain, in spite of its increasing complexity of structure and function to which it continues to attain, even in middle life, early reaches its limit of bulk and weight. At about seven years of age it attains what may be considered as its first limit for though it may increase somewhat up to twenty, thirty, or even later years, its progress is more slow after, than before seven. The vascular and the digestive organs as a whole may continue to increase even to a very late period (*Foster's Physiology*, p. 1151). After seventy, elements

( constituent ), sense, strength, courage and enthusiasm daily fall off ; at this age, one becomes grey-haired and bald-headed and being subject to dyspnea, bronchitis and other complications, becomes incapacitated for all activities (as before) and becomes like a dilapidated cottage, exposed to the fury of rain, storm and tempests. This is called old age." *Susruta I.* 35. 26".

"Infancy is phlegmatic, youth sanguinary and old-age nervous." *Susruta I.* 35. 27".

The following diseases may be *congenital* : malformations, syphilis, idiocy, hydrocephalus, hemophilia, infantile hemiplegia, osteomata, nevi, sclerema, pemphigus, dermatitis neonatorum, tetanus neonatorum, ichthyosis, acute fatty

75. वयस्त् विविधं, वाय्यं मध्यं छहमिति । तदोनेषोऽशवर्णोया वायासेऽपि विविधाः—चौरपाः, चौराङ्गादाः, अग्नादा इति । तेषु संबत्सूरपराः चौरपाः, हिसंबत्सूरपराः चौराङ्गादाः, परतोऽग्नादा इति । योऽशवर्णोयोरत्तरे मध्यं वयस्तस्य विकल्पो हङ्गिर्योर्बनं सम्पूर्णं ता हानिरिति । तदाविश्वेष्टुं चिराविश्वेषो यीवनमा- चत्वारिंशतः सर्वधात्रिन्द्रियवलबीर्थसम्पूर्णं ता । अत जर्हमीष्वत्परिक्षणियांवत्- समतिरिति । सप्ततेषु॒ चौथमाणधात्रिन्द्रियवलबीर्थोत्पाइनह्यहिनि वलीपलितद्वाचि- त्यजुष्टं वासवासप्रभृतिभिरुपद्रवैरभिरूपानं सर्वक्षियासमर्थं जीर्णगारमिवाभिष्ठमद- चौदशं हङ्गमाचत्ते ।

76. वाय्ये विवर्हते श्वे आ मध्यमे पितमेव तु ।

भूयिष्ठं वैते वायुर्द्वृद्धे तसीच्च योजयेत् ॥१७

सुश्रुतस्तिता, सूत्रसामन्, १५, २० ।

degeneration, myotonia congenita, progressive muscular atrophy, icterus neonatorum, atelectasis, hemoglobinuria.

*Hereditary diathesis*: rheumatism, gout, hepatic disorders, renal disorders, renal calculus, respiratory lesions, diabetes, obesity, adiposis dolorosa, acne, eczema, leprosy, arthritis deformans, hernia, hereditary cerebellar ataxia, hemophilia, alcoholism, pseudo-hypertrophic paralysis, progressive muscular atrophy, cancer.

*Diseases peculiar in infancy and childhood*: cretinism, infantile paralysis, measles, roseola, scarlatina, cerebro-spinal meningitis, chorea, rachitis, hemophilia, infantile scurvy, hypertrophic cirrhosis of the liver, diarrhoea, adenoids, bronchitis, broncho-pneumonia, spasmodic laryngitis, noma, endocarditis, primary renal sarcoma, eczema, pemphigus, seborrhea, ringworm, diphtheria, hydrocephalus, nodding spasm.

*Puberty and adolescence*: acne, seborrhea, anemia, chlorosis, chloroma, myxedema, exophthalmic goitre, catalepsy, trance, myoma, myolema, typhoids, meningitis, myocarditis, endocarditis, hysteria, cerebral embolism, epilepsy.

*Early adult age*: acute tuberculosis, pulmonary phthisis, gastralgia, gastric ulcer, syringomy-

elia, cerebral abscess, cerebral embolism, myoma, periodic paralysis.

*Middle age* : exophthalmic goitre, myxedema, diabetes, chronic nephritis, cysts of kidney, myocardial diseases, endocarditis, aneurism, leucemia, pernicious anemia, angina pectoris, ataxic paraplegia, dementia paralytica, paralysis agitans, intraspinal hemorrhage, myelitis, locomotor ataxia, psychosis polyneuritica, carcinoma, gout, cirrhosis of liver, gallstones, mollities ossium.

*Old age* : pruritus, ecthyma, gout, pephigus, epithelioma, carcinoma, gout, arteriosclerosis, cataract, gangrene, bronchitis, broncho-pneumonia, aneurism, prostatic disease, myocardial disease, angina pectoris, cerebral apoplexy, paralysis agitans, melancholia.

*Diseases special or predominant in females* : chlorosis, osteomalacia, chorea, floating kidney, lupus erythematosus, gallstones, constipation, chorea, hysteria, neurasthenia, catalepsy, goitre, myxedema, adiposis dolorosa, gastralgia, anemia.

In addition to the above-mentioned constitutional, metabolic or infectious diseases, there are of course countless other infectious diseases which can attack all ages and can bring about by slow or rapid process the cessation of vital activities and their co-ordination of the organism.

But though *death* is inevitable to multicellular life, Sśuruta emphasizes that natural death through degeneration of senescence is a very rare phenomenon: "According to Atharva-veda scholars, deaths are of one hundred and one kinds, of which the natural death (through old age) is one while the rest one hundred are accidental (including infection)." *Susruta* I. 34. 5". It is an undeniable fact, that protoplasm—the living substance, living a particulate life in unicellular existence and community life in mullicellular existence, under favorable conditions, has not necessarily any limitation of its life, and as every living organism, comes into existence as a protoplasm of a pre-existing living organism protoplasm is potentially immortal. Reproduction among the unicellular creatures is by fission, so in a sense they never die as long as proper conditions are maintained. But life can, also, be preserved under adverse circumstances with arrested vitality as in hibernation of many animals in winter. Even suspended vitality is not incompatible with life as many micro-

77.

एकोचरं वृत्यशतमध्याणः प्रचक्षते ।

तत्रैकः काङ्गसुऽक्षु ग्रीषा आगन्तवः सूताः ॥५

सुशुद्धस्त्रिता, सूक्ष्मानम्, ३५, ५ ।

es, or their spores, can be completely desiccated and kept in that state for many years, and after that if they find a favorable medium, they show their full activities again (*anabiosis*). Grains which have been found in ancient Egyptian tombs which have been lying there in a desiccated state for more than one hundred centuries, have been found to germinate. And many fish can be frozen with water and made an ice block and kept in that condition for any length of time and if it be thawed slowly, the fish can be revivified. Only when protoplasm is coagulated, it loses its vitality. Many trees are known, which according to reliable tradition, have lived more than a thousand years. Death comes to a tree by storm, lightning, fungi and parasitic diseases, improper nutrition from the soil either by the exhaustion or excess of some of the salts or the insoluble combination of others, improper moisture or sunlight ; but these are all accidental and are avoidable. It is asserted that there are authenticated cases of men who have lived more than 152 years. Old age is certainly a disease, brought about by the degenerative changes, caused by microbic infection, absorption of their toxins and unhygienic living. But this will be in future more or less controllable with better knowledge of prophylaxis, dietary,

rational living and hygiene. And very few people really die of senile degeneration. What actually happens is this : in the debilitated condition when the resisting power of the organism has been reduced, some infection takes place. Preventive medicine in future will possibly eliminate many of the virulent infections, but it can not implant that death will be preventable. Death is probably nature's economy of life. It eliminates those who are no more capable of reproduction or can not contribute materially to the support and provision of offspring, thus releasing the food-supply to the new-generation for growth, development and progress. Old age (*senility*) is the effect of the cumulative auto-intoxications. Organism in its very functioning—in the metabolic process, produces various toxic products, which, if not thoroughly eliminated, can accumulate in the organism bringing about degenerative changes. According to Metchnikoff toxins are principally absorbed from the putrefactive products of the large intestine and to counteract the activities of the proteolytic bacilli, which can only thrive in alkaline reaction, he proposed the introduction into the large intestine of the most active lactic acid producing bacilli (*bacillus Bulgaricus* or *maya ferment*) in the form of soured and curdled milk.

It is true that the large intestine serves no vital function in the economy of life, and it has been simply developed in animals as an accommodation, so that animals are not compelled to slow the speed and wait for defecation, while running. And animals with comparatively short intestine live relatively longer than the animals with larger intestine. And all the organs of the body do not equally show the signs of senile degeneracy. But the human body is a complex, intricate and delicate machinery. If any of the vital organs is seriously affected, it interferes with the integrity of the organism as all the organs are intimately related and interdependent. A diseased organ like the heart or the kidney can not be replaced like a broken or worn-out part of an auto or aeroplane machinery. They can be only slowly and gradually improved by a regenerating process of relieving them of the burden and tension by proper dietary and rational living. But every disease leaves an indelible mark, every shock an impression and every healed wound a cicatrix. And the effect is cumulative. If all the infections could be controlled, still there would be old age and death brought about by the slow but cumulative effect of the partial retention of the metabolic wastes, defective

hereditary inheritance, mental, emotional, and physical shocks and excitements.

Buffon calculated that the duration of life was six to seven times to that of growth, but Flourens estimated it about five times. As the epiphysis closes about twenty five in man, so it can be calculated that the longevity of man should average from 125 years upwards. This is certainly a respectable age compared to the present standard, though some of the animals, lacking intelligence and control over the environment are reputed to live longer as some authenticated records show : salmon one hundred years ; in the case of a carp one hundred and fifty years ; pike two hundred years ; crocodile one hundred years ; tortoise two hundred years ; eagle one hundred years ; parrot eighty years ; swan eighty years ; ducks and geese fifty years ; falcons one hundred years. In the records of zoological garden in confinement, the rhinoceros is known to have lived longer than thirty-seven years, and the average duration of the life of horses, asses and zebras from fifteen to thirty years, domestic cattle from twenty-five to thirty years, sheep, goats and antelopes from twelve to fifteen years, llama seventeen years, hippopotamus thirty-seven years, domestic swine twenty years, ele-

phants thirty to forty years, lions, tigers, bears about 25 years, domestic cats from twelve to twenty-three years, dogs from sixteen to eighteen years, hares and rabbits about ten years, mice and rats from five to six years, bats about seventeen years, monkeys eight to thirty years (*Ency. Brit.* Vol XVI. p. 975 ).

## **DISEASES AND THEIR CLINICAL STUDIES.**

"Ailing (*vyādhi*), disease (*āmaya*), sickness (*gada*), terror (*ātaṅka*), consumption (*yakṣma*) fever (*jvara*), indisposition (*vikāra*), and malady (*roga*) are synonyms. *Etiology* (*nidāna*), *prodrome* (*pūrvavarūpa*), *symptoms* (*linga*), *remedy* (*upasaya*) and *sequel* (*samprāpti*) are the *diagnostics* of a disease. That '*etiology*' means the causes of disease, has been previously mentioned. The premonitory symptoms that are observed before the development of a disease, are termed as '*prodromes*'. The symptom of a developed disease (the disease might stay in a latent state and the incubation of many infections may last for many years in a resisting organism) is called the '*linga*'. Characteristic (*ākṛti*), indication (*lakṣmaṇa*), sign (*chihṇa*), lineament (*samsthāna*), trait (*vyañjana*), feature (*rūpa*) are synonymous terms with symptom (*linga*). Remedy is called that combined action of medicine (*auṣadha*), diet (*āhāra*) and hygienic living (*vihāra*), which cures the disease by counteracting either its

causes or symptoms. Sequel (*samprapti*), outcome (*āgati*) and after-developments (*jāti*) are synonymous." *Charaka* II. 1. 2<sup>7</sup>.

"*Fevers* are being mentioned in the beginning of the book of pathology, for fever is the first expression of all physical diseases." *Charaka* II. 1. 6<sup>7</sup>.

*Fever* (*pyrexia*) in which the normal temperature is markedly exceeded for any length of time above about 37 degree Centigrade or 98. 6 degree Fahrenheit, is caused by the disturbance of the heat-regulating mechanism. Whatever stimulates the thermogenetic centre or unduly constricts the vaso-dilators so that the excess of heat can not be dissipated, provokes fever. In sun-stroke, the peripheral nervous mechanism is

78. तद व्याधिरामयो गद आतहो यसा जवरा विकारो रोग इत्यनुर्धानाम् ।  
तस्योपलभिर्निर्दानपूर्वकपलिङ्गीपश्यसम्भासितम् । तद निदानं कारणमित्रान्तमये ।  
पूर्वकपः प्रागुत्पतिलक्षणं व्याधेः । प्रादुर्भूतलक्षणं पुनर्लिङ्गमाळतिलक्षणं चिह्नं  
संस्थानं अच्छन्नं क्षपित्यनष्टान्तरमित्यचिन्द्रयेऽ । उपशयः पुनर्हेतुव्याधिविपरीताणां  
विपरीतार्थकारिणाच्चीवधाहारविहाराणामुपयोगः सुखातुवन्धः । मन्मात्रिरागतिर्जीवि-  
रित्यनर्थानां व्याधेः ।

चरकसंहिता निदानस्थानम्., १ ।

79. इह खलु जवर एवादी विकाराणामुपदिश्यते तत् प्रथमलाञ्छारीराणाम् ।  
चरकसंहिता निदानस्थानम्, १ ।

paralyzed and consequently the body temperature is considerably raised. But when a toxin is introduced into the blood, the auto-defensive mechanism of the body—adrenals and thyroids—are stimulated and their oxidase-secretions are poured into the blood stream, the heat-generating centre is also excited by reflex and sympathetic stimulation, so that by the enhanced metabolism, the toxic products and their agents can be made comparatively harmless to the organism, if not destroyed. Adrenal secretion raises the blood pressure by constricting the vessels so that the toxins and their pathogenic agents are subjected forcibly to the immunizing action of the blood. Thyroid secretion dilates the blood vessels so that the attenuated toxins can be eliminated by sweating to relieve the kidney of its heavy burden, if it has not been equal to the task imposed upon it. Fever is the physiological expression of the severity of the struggle between the invading enemies and the host for self-defence, that is, the reaction that has been set up in the body to make innocuous the toxins and the micro-organisms that produce them. Fever is the index of the resisting power of the organism against the virulence of the infection. It is the nature's healing process, and indicates that the auto-

protective mechanism of the body is active. Absence of fever in a toxemia of any kind proves the inability of the body to react, owing to deficient sensitiveness of opsonin of the blood and the immunizing glands, either inherited or acquired, or to the fact that the toxin is itself a very powerful paralyzant or anesthetic of the sensory impressions. Hyperpyrexia (fever above 105° F.) on the other hand indicates the hyper-excitation of auto-defensive mechanism and the consequent over-production of the immunizing principles, and if long continued, might lead to the protoplasmic destruction of the red-corpuses and the endothelial cells by hemolysis and autolysis. This excessive disintegration of the protoplasm is indicated by the increased excretion of nitrogen, sulphur and phosphorus and in extreme cases, acetone, aceto-acetic and B-oxybutyric acids with the urine. And this is attended with many functional derangements. The activity of the digestive glands is diminished, hence loss of appetite and inanition. On hepatic cells is imposed the heavy task of reducing excessive metabolic wastes, especially the vast number of red-corpuses, and the consequence of the hepatic hyper-activity is the greatly increased production of the hepatic excretory product—the

bile. And if it is continued long, it causes 'bilious remittent fever or malarial hemoglobinuric fever' (*paittika jvara, Suśruta VI. 39. 12*) in which the urine is brownish yellow in color, containing a good deal of urobilin, less of urea, but more of ammonia, as the excessive quantity of sulphur and phosphorus—the disintegration-productions of abnormal destruction of red corpuscles, become oxidized into sulphuric and phosphoric acids and readily combine with ammonia which otherwise would have been changed into urea. There is of course pronounced jaundice. The liver becomes fatigued and sluggish in its activity. Gradually commences the fatty and granular degeneration of its cells. The kidney also shows its terrible strain by fatty and fibrous infiltration.

### *I. Fevers.*

"Fever is caused by lesions of the body or the mind; for fever otherwise can not be developed in a person without injury." *Charaka VI. 3. 10<sup>o</sup>.*

80.

तस्य प्रतिकृद्विषा दोषाः शारीरमानसाः ।

देहिनं न हि निर्दोषं ज्वरः समुपसेपते ॥

चरकसंहिता, चिकित्सासामन्तम्, १ ।

"Excessive use or abuse of 'snehādi' [Sneha = unguents, sveda = sweating through Turkish bath or other sudoriferous means, vamana = vomiting, virechana = purgation : absorption, retention (of any toxic matter) or exhaustion fever], traumata (ubhighāta = shock or wound fever), development of disease (rogotthāna = symptomatic fever as a reaction against the pathogenic germs and the toxins elaborated by them), tumescence (prapāka = coction of tumefaction, that is inflammatory fever), fatigued (śrama = fatigue fever), inanition (kṣaya = consumption, that is consumptive or famine fever), indigestion (ajīrṇa = dyspeptic fever), toxin (viṣa = toxemia) mental derangement (sūtmyarttuparyāya = hysterical fever), smell of poisonous flowers (oṣadhi-puṣpa-gandha = coyza or hay fever), worry (śoka = depression fever), sudden seasonal changes (nakṣatra-prapūḍana = stellar vexations = spring or autumnal fever), hypnotism (abhibhāra = exorcism : hypnotic fever), enervation (abhisāpa = execration : nervous fever), desire or passion (munas or kāma = unreciprocated and ungratified sensual passion : erotic fever), hallucination (bhūvabhisāṅkā = fear of ghosts : hallucinary fever), the unhygienic living of a woman that has miscarried or has given normal birth

(puerperal fever), the establishment of the secretion of milk following childbirth (*stanyārataranya*=milk fever)—these causing lesion of the nerve etc. produces *fever* in human beings.”  
*Susruta VI. 39. 8.*<sup>1</sup>

“Excessive consumption of astringent, dry or cold food and drinks, excessive use of vomiting, purgation, sweating and snuffs; and over-exercise, retention of feces and urine, fasting, traumata, venery, anxiety, sorrow, vigilance—excess of these things irritate the nerves.”  
*Charaka II. I. 8*<sup>2</sup>.

“In the erotic fever, there is a good deal of contemplation (of the beloved object) and

81. निष्ठातिशुक्लैरपि च केहायैः कर्जभिन्नशाम् ।  
 विविधादभिवाताऽरोगोत्थानात् प्रयाकातः ॥  
 अमात् चयादजीर्णवा विषात् सामग्रुष्पर्यायात् ।  
 शोषधीपुष्पगम्भाऽशोकान् नववपीष्मात् ॥  
 अभिचाराभिशापाभ्यां मनीसूताभिशङ्ख्या ।  
 श्रीष्टामप्रजातानां प्रजातानां तथाहितैः ।  
 सव्यावतरणे चैव उरं दीदेः प्रवर्त्तते ॥८

सुनुतुहिता, उत्तरतन्त्रम्, ३६, ८ ।

82. वचलयुक्तीतवमनविरेचनास्थापनविरेचनातिथीत्यायामवेगसन्धारणा-  
 नमनाभिशातव्यायोहे गयोक्षीषितातिविजागरणविषमश्चासुभोऽतिसेवितेभी वाकुः  
 वक्षीषमापदते । चरकर्वहिता, निदानस्थानम्, ११ ।

sighing ; in the fever of sorrow, tears ; in the fever of fear, anxiety ; in the fever of anger, excitement ; in the hallucinary fever, delusion ; and in toxemia, unconsciousness, illusion, intoxication and enervation." *Chandka VI. III. 115.*<sup>13</sup>

"In the gastro-intestinal fever, there are anorexia, indigestion, heaviness of the stomach, the irregularity of the heart ( beat ), semi-consciousness, lassitude, continued fever, unchangeability of the lesion, nausea, salivation, lack of hunger, sliminess of the mouth, fatigue, somnolence and heaviness of the body, polyuria, loose feces and enervation—these are the symptoms in the gastro-intestinal fever." *Charaka VI. III. 125*<sup>14</sup>.

83. ध्यानं निःश्वासवहुलं लिङ्गं कामज्वरे अृतम् ।  
शोकजे वायवहुलं वासप्रायं भयज्वरे ॥  
ओधजे बडुसंरथं भूतावेशे त्वमानुषम् ।  
मूर्खानीहमदम्लानिभूयिष्ठं विषसन्धवे ॥  
चरकासंहिता, चिकित्सासामन्, १ :

84. अरुचिशाविपाकश गुरुत्वद्वरस्य च ।  
हृदयस्थाविग्यविश तद्वा चालस्थमेव च ॥  
ज्वरोऽविदग्धे वलवान् दोषाणामप्रदर्शनम् ।  
लालाप्रदिको हङ्गासः चुङ्गाशोऽविशदं सुखम् ॥  
स्वाधसुप्तगुरुत्वं गांवाणा वडुमूवता ।  
न विह्नीर्चां न चाम्हानिज्जरसामस्य लक्षणम् ॥  
चरकासंहिता, चिकित्सासामन्, १ ।

"Lassitude, watery eyes, yawning, heaviness of the body, fatigue, inclination and disinclination by turn for fire (to sit by the fire side), sun (sun-bath), breeze and water (bath), indigestion, foul taste in the mouth, gradual change of the (physical) strength, complexion and temperament—these are the prodromal symptoms of fever." *Charaka VI. III. 25<sup>ss</sup>*.

"Excessive internal heat (hyperaemia), thirst, delirium, quick respiration, illusion, pain at the joints, cessation of the perspiration and constipation—these are the symptoms in hyperpyrexia (at the onset of malarial fever the blood is driven from the peripheral to the internal organs, where there is excessive congestion, and while the surface of the body shivers with chills, there is increased high temperature)." *Charaka VI. III. 35<sup>ss</sup>*.

85. आस्था॑ नयने साक्षे॒ वृच्छा॑ गौरवं लमः॑ ।  
ज्वलनातपदाय॑ ब्लुभक्षिह॑ वाचनिष्ठिती॑ ॥  
अविपाकास्थैरस्य॑ हानिश॑ वलवर्णयोः॑ ।  
शीलधैतमल्पस्य॑ उवरलच्छणमयगम्॑ ॥  
चरकसंहिता, चिकित्सास्थानम्, ३, ३५ ।

86. अनाद्वृहोऽधिकसृष्टा॑ प्रलापः॑ वृसर्गं धमः॑ ।  
सन्ध्यास्त्रियलमस्ते॑ दो दोषवशोऽविनियहः॑ ॥  
अनन्तं गस्ति लिङ्गानि॑ ज्वरस्ते॑ तानि॑ लक्षयेत्॑ ॥  
चरकसंहिता, चिकित्सास्थानम्, ३, ३५ ।

Though the principle of Hindu medicine is based basically on humoral pathology, it seems, Suśruta formed a vague relationship of malaria with mosquito bites and swampy localities, where mosquitoes are developed. And it was ascribed to a particular kind of mosquito, and not to all classes of them.

"There are five types of *mosquitoes* (*maśaka* belonging to the '*Culicidae*' family, consisting nearly of one hundred genera and eight hundred species), namely '*marine*' (*sāmudra* = coastal mosquitoes), '*globular*' (*parimanyala* = perhaps the mosquitoes belonging to the genus '*migarhininae*' which has strongly curbed proboscis), *culex* *elephanti* (*hastimasaka*), '*dark*' (*kṛṣṇa* = taeniorhynchus) and '*mountainous*' (*pāvvatīya* = anopheles). The biting of the '*mountainous*' mosquito (anophles) produces an effect like that of deadly insects." *Suśruta* V. 8. 18<sup>7</sup>.

"If the part bitten by a spider becomes swollen, white, black, red or bronzed (cyanotic or degenerative changes), and there are symptoms of

87. मश्काः—सामुद्रः परिमन्यलो हस्तिनश्वकः शृणुः पार्वतीय इति पथ ।  
तैदं दृश्य दीव्रकम् दैश्वशीफच । पार्वतीयस्तु कीटैः प्राणइर्मुख्याच्छयः । गद्धाव-  
ड्डेऽप्यथं पिङ्का' सदाहपाका भवति । जलौकसां दृष्टुचरणसुत्ता' चिकित्-  
सितच ॥ सुशुद्धुः हिता, कल्पस्थानम्, ३, १८ ।

fever, burning pain, dyspnea, hiccup and headache, the prognosis is usually bad." *Charaka VI.* 23. 45<sup>\*\*</sup>.

"There is a kind of mountainous mosquito whose bite causes symptoms like the bite of deadly spiders (*lūta*—aranea)"\*\*\*.

According to medical experts, tertian(*trtiyaka*) and quartan (*chaturthaka*) fevers ( of malarial origin ) are produced by nervousness ; while the valley or the marsh *aupatyaka*—at the foot-hill of the mountains, that is the swampy Tarai of the Himalayas where anopheles is found in large numbers and malaria is endemic ), and drink or intoxication ( *madya-samudbhava* = produced by wine ) fevers are ascribed to blood-pollution ( *pitta-kṛta* = corruption of the bilious principle, which is the blood ). Pneumonia (*pralepaka*) and

88. शोफाः ये ताः सिता रक्ताः पीता वा पिङ्काज्वरः ॥  
प्राणान्तको भवेद्द्वौ शावहिकाश्चिरयहाः ॥  
चरकसंहिता, चिकित्सास्थानम्, २६, ४५ ।

88. (a) कष्ठ् गान् नशकैरेष्व्युक्तिः स्वाध्यन्वेदनः ।  
चराध्यक्षीटसहस्रसाध्यनश्चतम् ॥  
चरकसंहिता, चिकित्सास्थानम्, २६, ४५ ।

influenza (*vātavalāsaka*) fevers are said to be of phlegmatic origin. *Susruta* VI. 39. 25<sup>o</sup>.

It has now been definitely proved that the mosquito of the genus of *anopheles* transmits the deadly malarial germ from man to man. It may be possible, however, that there are other carriers of malarial pathogenesis. And *anopheles* is not the only genus that is guilty. Yellow fever is transmitted by *Stegmia calopus*, dengue fever by *Culex fatigans*, *filaria bancrofti* by *Culex fatigans*. But all *anopheles* do not carry malarial protozoa. *Anopheles* has nearly one hundred species (*Culex* two hundred), of which only forty species have been proven experimentally to be the hosts in malaria and in India there are only ten of them as follows : *Myzomyia culicfactes*, *Myzomyia listonii*, *Myzomyia turkhundi*, *Pyretophorus jeyporensis*, *Myzorhynchus barbirostris*, *Myzorhynchus sinensis*, *Nyssorhynchus theobaldi*, *Nyssorhynchus stephensi*, *Nyssorhynchus fuliginosus* and *Nyssorhynchus maculipalpis*. According to Theobald none of the *anophelinae* species

89. वाताधिकत्वात् प्रवदनि तज्ञासूतीयकाचापि चतुर्थकाच ।

चोपत्वके नदासमुद्भवे च हेतुं ज्वरे पितकासं बदनि ।

प्रख्येपकं वातवज्ञासकाच कफाधिकत्वेण बदनि तज्ञाः ।

सुशुत्तरं हिता, उत्तरदाम, ३, १४ ।

of *Feltinella*, *Bironella*, *Aldrichia*, *Chagasia*, *Chrystia*, *Kerteszia*, *Myzorhynchella* and *Lephoscelomyia* have been found to be the bearers of malarial germs.

But the protozoan parasites of the red blood-corpuscles that cause remittent or intermittent malarial fevers, are not the same, and they appear under four chief forms : tertian is caused by *plasmodium vivax*, quartan fever by *plasmcdium malaria*, estivo-autumnal fever or subtertian malarial fever by *plasmodium falciparum* (*lavernia malaria*, *plasmodium precox*), quotidian fever by *plasmodium falciparum quotidianum*.

These four kinds of blood-parasites produce different reactions in the organism according to their characteristics. *Plasmodium vivax* requires forty-eight hours to complete the cycle of schizogony and sporulates principally in the spleen, liberating toxins which are hemolytic, pyrogenous and hemozoanous, and will provoke an attack of fever with single brood in the human host every forty-eight hours, that is on the third day and accordingly it is called '*tertian*' (*trtiyaka*), and in the intervening period there is remission of fever. *Plasmodium malaria* needs seventy-two hours to complete its schizogon, and it principally sporulates in the peripheral blood, and the liber-

ated toxin causes a severe constriction of cutaneous vessels, thus provoking shivering chills on the surface and chattering teeth, though the temperature of the blood is rising rapidly, and driving the blood centripetally, causing congestion of the internal organs ; as it takes seventy-two hours for the cycle, that is, the fever appears every fourth day with a single brood of infection, it is called '*quarten*' (*chaturthaka*). Laverania malaria is irregular in its sporulation and needs about from thirty-six to forty-eight hours for schizony, and as it sporulates in the red corpuscles of the blood, it causes an immense destruction of them, and as the pathogenic protozoon needs high temperature for its development, the fever takes place in the autumn, and is therefore called '*estivo-autumnal*' (*sāradiya*). This is the most malignant of malarial fevers, for it not only causes a heavy destruction of the red corpuscles of the blood, and it is calculated that there are nearly 25, 000, 000, 000, 000 red corpuscles in an adult human being, and it needs about 3, 000, 000, 000 of them to be affected to cause an acute fever, and if it be below 250, 000, 000, the malarial fever does not manifest and remains in a latent state ; but it can also provoke serious lesion in the brain, pancreas, liver, spleen

and other internal organs by forming thrombi through blocking the capillary passage by the accumulation of plasmodia, swollen endothelial cells laden with hemozoan and sporules. The bilious remittent fever ( bilious hemoglobinuric or *blackwater fever* = *pitta-jvara* ) is also caused by it by the excessive destruction of erythrocytes which necessarily imposes a heavy labor on the liver, with the consequent production of excessive quantity of bile, which produces jaundice of the tissues and also appears in the urine with other pigments ( *hemozoan* ) and the urine looks from brownish yellow to blackish in color. The *quotidian* ( *anyedyuṣka* ) fever may be produced by plasmodium falsiparum quotidianum which takes twenty-four hours for schizogony, or by three broods of plasmodium malaria, triple quartan fever, the parasites coming to maturity on three successive days ), two of plasmodium vivax ( *double tertian fever* ), or two of laverania malaria ( *double estivo-autumnal* or *double subtertian fever* ).

At the onset of malarial fever, all these types tend to be irregular, for the simple reason that the pathogenic sporozoa are of different ages and inoculated at different times, and only as the disease proceeds, the fever becomes regular,

possibly because the parasites that can not conform to the age period of the majority in their schizogony, when the organism offers least resistance) overwhelmed by the combined attack of the parasites and the toxins liberated by them becomes exterminated by the anti-toxins of the blood) produced as a reaction.

"The fever that lasts for seven, ten or twelve days without interruption, is called '*santata*' (*simple continued fever*, produced by a bacillus, resembling *coli communis*, or the remittent fever produced by *spirocheta carteri*, known also as the relapsing fever or typhus *recurrens*) ; the fever that appears twice in day and night, is called '*satula*' (*doule-quididian* or *Kala azar*, produced by a protozoan parasite *Leishmania donovani*, and it grows in large numbers by fission, and is principally found in the liver, spleen, bone-marrow, lymphatic glands and to a less extent, in the pancreas, kidneys, suprarenals, lungs and testicles) ; the fever that appears on every third day, is called '*trtiyaka*' (*tertian*) ; and which appears on every fourth day, is called the '*chaturthaka*' (*quartan*)."  
*Susruta VI. 39. 31*"

90. सत्ताहृं वा दशाहृं वा बादशाहमधापि वा ।  
 सन्तात्या योऽविसर्जीं स्नात् सन्तः स निगद्यते ।  
 अहोरात्रे सन्ततकी धौ कालाद्युषर्तते ।

"The unhygienic living after the relief from (the primary onset of) the fever, aggravates the lesion, and owing to the low vitality (of the organism) deranges nerves and phlegma, and causes the development of *double-quotidian* (*sata-ta = kala-azar*), quotidian (*anyedyuska*), tertian (*trtiyakā*), quartan (*chaturthaka*) and pneumonic (*pralepaka*) acute fevers." *Susruta VI.* 39. 22<sup>1</sup>.

"Tremor, irregular onset of fever, congestion of neck, face and lips, insomnia, suppression of sneezing, desiccation of the body, pain especially in the head and the heart, foul taste in the mouth, constipation, flatulence (*ādhmāna* = swelling) and yawning are the symptoms of 'vāta' (cerebro-spinal estivo-autumnal pernicious) fever.

Onset of fever with rigor, diarrhoea, diminished sleep, vomiting, tumescence of the neck, face, lips and nose, sudoresis, delirium, bitter taste in

स्नेयुक्तज्ञेशावादिककालं प्रवर्तते ।

दतीयकसृतीयेऽङ्गि चतुर्थेऽङ्गि चतुर्थकः ॥३१

सुश्रुतसंहिता, उत्तरतन्त्रम्, १६, ३१ ।

91.

चामाणं ज्वरसुकालं मिथ्याहारविषारिणाम् ।

दोषः स्वल्पोऽपि संवृद्धो देहिनामनिलिपितः ॥

सतताच्चेद्युक्तव्याख्य-चातुर्थान् सप्रलेपकान् ।

कक्षस्थानविभागेन यथाच्च 'ख' करोति हि ॥

सुश्रुतसंहिता, उत्तरतन्त्रम्, १६, ३२ ।

the mouth, semi-consciousness, hyperpyrexia, intoxicated state, polydipsia, the yellowish tinge of the feces, urine and the eyes, and vertigo are the symptoms in 'pitta' fever (*bilious remittent fever*: known also as malarial hemoglobinuria or blackwater fever).

Heaviness of the body, chills, expectoration, horripilation, excessive sleep, sluggish circulation, mild onset of fever, salivation, sweet taste of the mouth, low fever, vomiting, lassitude of the body, indigestion, acute coryza (*pratisyāya* = profuse secretion of the watery mucus from the nose), loss of appetite, and whiteness of the expectoration and the eyes are the symptoms of 'slema' (influenza) fever." *Susruta* VI. 39. 11-13<sup>o</sup>.

१२. वेष्युर्बिषमो वेगः कण्ठौषुखशीषणम् ।  
 निद्रानाशः चवस्तभो गावाणां दीच्छमिव च ॥  
 शिरोहृदगाववगत्तु-यैरस्त्रुं बहुविट्काता ।  
 ज्याघानां तथा शलं भवत्यनिलजे उरे ॥११  
 वेगसोक्षोडितसारस्त्र निद्राल्पत्वं तथा वर्णः ।  
 कण्ठोषुखनामाणां पाकाः स्वे देश जायते ॥  
 प्रखापः कटुता वक्तुं मूर्खां दाहो मदसूक्षा ।  
 पोतविष्मूवनेवत्वं पैतिकि भन एव च ॥१२  
 गीर्वं शीतसुत्कृष्टो शो रोमहर्षोऽतिनिद्रता ।  
 खोलोरोधो बगलत्वं प्रसिको मधुरास्यता ॥  
 नात्युष्णगावता चक्षुं रक्षसादोऽविपाकता ।  
 प्रतिष्ठायोऽरुचिः वासः वाक्फलेऽस्त्रोद्य गुह्यता ॥१३  
 सुन्तुतस्त्रिता, उत्तरतन्त्रम्, १८, १६ ।

*Eruptive Fevers* : "Feverishness or chilliness by turns ; pains in the bones, joints and the head (headache) ; watery, glazed or reddish, dilated or contracted eyes ; hissing sounds and pain in the ears ; neck as if covered with grains (*sūka*=eruptive typhoid papules) ; somnolence ; illusion ; delirium ; coughing ; dyspnea ; loss of appetite (*anorexia*) ; delusion ; the tongue is rough and has the color of burnt coal (dry, brown, thickly coated, fissured and tremulous) ; inertia of the body ; nasal discharge mixed with blood (nose-bleed) ; bilious sputum (vomiting) ; agitation of the head ; insomnia ; angina pectoris ; scanty perspiration, urination and defecation ; the patient does not look emaciated ; sound in the neck (sonorous or sibilant rales indicating bronchitis) ; appearance of rose-red exanthem (*kotha*) and rashes (*maṇḍala*) ; aphasia (*mūkatva*) ; lesion in the circulatory system, heaviness of the epigastrium (flatulence) ; and the delay in the coction of the deranged humors (the long duration of the disease and convalescence from it) are the symptoms of the typhoid fever."

*Charaka.* VI. 3. 85<sup>\*\*</sup>.

"Altogether through (varied) lesion, there are thirteen kinds of *typhoid fevers*." Charaka I. 17. 16<sup>a</sup>.

It is very probable that all the eruptive fevers have been classified by Charaka, as *typhoid fevers* (*sannipāta jvara*), including in the category typhus, paratyphoid, cerebro-spinal meningitis, measles, mumps, erysipelas, diphtheria, toxemia, septicemia, pneumonia, puerperal fever and small pox. Charaka and Suśruta both mention smallpox as 'masūrikā.'

"Due to lesion of the phlegma and the biles (circulatory blood), tiny rashes, anorexia, exudative vesicles, called 'romānti' (varicella or chicken

साक्षाते कलुषे रक्ते निसुप्ते चापि दर्शने ॥  
 सख्ती सहजी कर्त्ता कर्षः यक्तेविवाहतः ।  
 तद्वा भोइः प्रकापव चासः चासोऽवचिर्वैमः ॥  
 परिदग्धा खारस्यर्था जिह्वा जासाङ्गता परम् ।  
 छोडनं रक्तपिण्डस लफेनोण्डिशितस च ॥  
 विरदो छोडनं दृश्या जिह्वानामो हृदि अथा ।  
 से हृष्टपुरीषाचां चिराहं नमस्यतः ॥  
 छाप्तव्यं नातिगावाचां प्रतां कर्षकृत्तम् ।  
 बोठाळां आवरत्ताचां मख्तालाच दर्शनम् ॥  
 शूद्रव्यं बोतसां पापो गुरुत्वमुदरस्य च ।  
 चिरात् पापव दाचाचां सन्निपाताचराहतिः ॥  
 चरकसंहिता, विकितवाक्यानम्, ३ ।

94.

उन्मेषे को विकाराते सन्निपाताचर्योदय ॥

चरकसंहिता, सूक्ष्मानम्, १३ ।

pox) appear with fever, itching and polydipsia. From bile and phlegma (corruption of), the tumescence of the pustules that appear all over the body like lentils (ervum lens : ervum menus), is called the variola or small pox (*masūrikā*)."  
*Charaka VI.* 12. 73<sup>o</sup>a.

"The painful, copper-colored, bronzed pustule that appears all over the body and within the mouth with burning fever, is called the *variola* (*masūrikā*)."  
*Susruta II.* 13. 30<sup>o</sup>.

"The typhoid fevers after passing through a crisis on the seventh, tenth or twelfth day, either become relieved or kill the patient."  
*Susruta VI.* 39. 18<sup>o</sup>.

As it was believed that disease was due to the derangement or the disharmonious combination of the humors of the body, the cure lay in their

94. (a) चुद्रप्रमाणाः पिङ्काः शरांर सर्वाङ्गाः सज्जरदाहृताः ।  
 कश्युताः सारचिसप्रसेका दोमानिकाः पितकफात् प्रदिष्टाः ॥  
 याः सर्वगनेषु भस्त्रलादा भस्त्रिकाः पितकफात् प्रदिष्टाः ।  
 चरकसंहिता, चिकित्सास्थानम्, १२ ।

95. दाहज्वरदणाबन्तसावाः छोटाः सपौत्राः ।  
 गदेषु बदने चान्तर्विज्ञे याका भस्त्रिकाः ॥१०  
 सुश्रुतसंहिता, लिदानस्थानम्, १३ ।

96. सप्तमे दिवसि प्राते दशमे चादरेत्पि वा ।  
 पुनर्षोरतरो भूत्वा प्रश्नम् याति इति वा ॥१८  
 सुश्रुतसंहिता, उपरतम्भम्, १८, १८

proper combination by coction. The internal heat that was supposed to cause coction of the humors and thus to preserve the balance of the humors, requisite for normal health, was supposed to be dissipated to the peripheral organs by morbid agents and thus to produce fever. Cure from a disease only took place when the internal combustion (metabolism or oxidation) was normalized again. This was brought about by hygienic living and dietary regulation. Medication was but supplementary. It is well known that quinine, the bitter alkaloid of the cinchona bark is a powerful remedy against the malarial plasmodia. Though cinchona is a native of the South American Andes, it belongs to the Rubiaceous family of which there are many members in India. Charaka in the treatment of malarial fever mentions a bitter (*tiktaka*) juice of leaves or bark, or concoction of a dry bark, but it is very hard now to identify what he meant by it :

“In new fever, fasting, sweating, time, barley water and bitter extract (*riktuka rasa*) cause the coction of raw humors (that is, bring about the cure).

“In the cerebro-spinal remittent fever and influenza, when the patient is thirsty, give him

hot water to drink. In the biliary remittent fever, cook bitter (bark or root) in water and when it is cooled, give it to drink. Such a concoction is stimulating (*dīpana* = digestive), oxidising (*pāchana* = which causes coction of the humors), febrifuge (*jvaraghna*), blood-purifying (*srotasām sodhanam* = purifier of the streams, as the blood, lymph, urine), vitalizing (*valya*), appetizing (*ruchi-kara*), sudorific (*ghar-ma-kara*) and is beneficial." *Charaka VI. 3. 129.*<sup>97</sup>

That this treatment was only meant for malarial fevers, is clearly indicated by the following passage : "At the onset of the (malarial) fever fasting is proper. But it should not be followed in consumptive, nervous, phobia, excitement, depression and fatigue fevers. By fasting pathogenic agents (*dosa*) are destroyed and when metabolism is stimulated, the body

९७      वहनं देहं कालो श्वानुक्रियते रसः ।  
 पाचनाव्यविपक्तानां होषाणा तदैव वरे ॥  
 दृष्टे सविकल्पीयं दयादातवपञ्चरे ।  
 नयोद्ये पैतिकि चाष वीतां तित्तकैः मतम् ॥  
 होषनं पाचनस्य च अवरप्रसुभवत् तत् ।  
 जोतसां गोषनं चत्वं द्वित्तेदकरं विषम् ॥  
 चरकदंडिमा, चिकित्साकान्तम्, २ ।

becomes light and hunger appears. But fasting should not lower vitality (that is fasting for a longer period than is necessary is injurious), for recovery depends on the vitality of the patient, and the object of treatment is recovery."

*Charaka VI. 3. 128*".

"In all kinds of fever, treat it by counter-acting the causative factors. In fatigue, consumption and wound (*abhigāta* = wound or traumatism) fevers, treat the original disease." *Suśruta VI. 39, 73*".

"As long as the fever patient does not regain his strength (i. e. does not completely recover), he should not indulge in shower-bath (*pariṣeka*), plunge-bath (*avagāha*), beverages, vomiting etc. (*samsodhana*), inunction, day-sleep, exposure to

98. उचरे सङ्कनमेवादातुपदिष्टते ज्वरात् ।  
ज्वरानिपिभवतोपचारमशोकश्चनः इत्यात् ॥  
सङ्कनेन चयं नीते देहे सञ्चुषितेऽनुषि ।  
विजरलं सपुत्रवचं चुवैवास्त्रोपचारते ॥  
प्राचादिलोधिगा चैते सङ्कनेनोपपादयेत् ।  
वसाभिष्ठानमारोग्यं बद्धीऽस्मं क्रियाकालः ॥

चरकसंहिता, चिकित्सासामन्, १, १२८ ।

99. चिकित्सेत्वा ज्वरान् सर्वां लिनिताना विपर्यवेः ।  
श्वनस्थानिषाकोत्त्वे मूलव्याधिसुपापरित् ॥७१  
सुमुतर्संहिता, उचरतामन्, १८, ७१ ।

cold, exercise and sexual intercourse." *Susruta* VI. 39. 68<sup>100</sup>.

"If a fever patient suffers from indigestion, old wine and barley broth is beneficial to him. If a fever patient suffers from coryza and anorexia (influenza), let him drink whey mixed with 'tribhasu' (a mixture of *sunthi*—ginger, 'maricha' black pepper, *pippala*—long pepper; Gr. 'diu trion piperidon' made of the same ingredients, *piperis longum*, *piperis nigri*, and *zingiberis*). In an exhaustive continuous fever, if the patient is emaciated, on the road to recovery, mentally depressed, in cerebro-spinal or bilious remittent fever, or if the pathogenesis is not well-marked, if the patient is desiccated, has polydipsia and burning sensation, drinking of milk will benefit him. But in new fever, milk should not be drunk, as it might even cause death:" *Susruta* VI. 39. 63<sup>101</sup>.

100. परिवेकावगाधांश लंडान् संशोधनामि च ।  
आगाभ्यङ्गदिवास्त्र-श्वेतव्यायामयोषितः ।  
न भजेत ज्वरीत्पृष्ठो यावद्दो यक्षान् भवेत् ॥  
सुमुतस्त्विता, उत्तरतन्त्रम्, ३६, ५८ :

101. मद्यं पुराणं मन्दाग्नेयं वाऽनोपहितं हितम् ।  
सश्वीषं वितरेत् तकं कफारोचकपीडिते ॥  
क्षारोत्त्वदोषो दीनश नरो जीर्णज्वराहितः ।  
विषहः दृष्टदोषह इच्छः पित्तानिलज्वरी ॥

\*In a long-standing continuous or remittent fever, if the patient becomes emaciated, he should be treated by light and easily-digestible food for his fever. Broth of a bean (*mudga = phaseolus mungo*), red lentil (*masūra = ervum hirsutum*), gram pea (*chanaka = cicer arietinum*), plantain (*musa paradisaica*), and dolichon biflorum. The fever patient that likes meat, can take the partridge (*perdicum cheninensium*), *perdicum francolinorum*, black antelope (*antilocaprum nigrarum*), *hystricum*, small deer, hart (*leporum*), black-tailed deer, golden-colored deer and antiloparum albarum. The crane (*gruidæ*), heron (*ardeidæ*), peacock (*pavo*), chicken (*gallos domesticos*) and heath-cock (*tetraoninnæ*), are hard to digest and very excitant; for this reason they are not prescribed by many physicians. But when the fever patient is nervous, it can be given in a moderate quantity." *Susruta VI.*  
39. 67<sup>102</sup>.

पिपत्सारं: सदाहो वा पयसा स सुख्ना भवेत् ।  
तर्द्ध तु पयः पातं तर्षणे हलि मानवम् ।  
सुश्रृतसंहिता, उत्तरतन्त्रम्, ३६, ६३ ..

102. सततं विषमं वापि क्षीणस्य मुजिरोत्पत्तम् ।  
ज्वरं संभोगमैः पर्यैर्लंघुभिः लद्धपाचरेत् ॥  
सुदाहूर् मन्त्राद्यवकाश् कुञ्जाथः ग् समकृष्टवान् ।  
आहारकाले यथावधे ज्वरिताय प्रदापर्यत् ॥

But Charaka only recommends their broth and not their flesh; however, this meat-broth can be a little acidulated with the admixture of pomegranate (*punica granatum*) to make it more palatable VI. 3. 165<sup>105</sup>.

"Milk boiled together with ginger, raisins and dried dates, and mixed with honey or sugar relieves thirst and fever. Or the milk might be diluted with water four-fold and cooked together; this is beneficial in old fever, and the drinking of hot milk is good in bilious remit-

मावान् कपिङ्गलानेषान् पृष्ठताञ्चरभाञ्चशान् ।  
कालपुच्छान् तुरङ्गांश तयेव समादकान् ॥  
मांसार्जे मांससामग्रानां ज्वरितानां प्रदापयत् ॥  
सारसक्रोचयित्विनः कुञ्जुटांसिनिरौलाघा ।  
गुड्डखलान्नं शंसनि उवरे कैचित्विकित्सकाः ॥  
ज्वरितानां प्रकोपन्तु यदा याति समीरणः ।  
तदैतेऽपि हि श्वसने मावाकालोपपादिताः ॥

सुश्रुतस्त्रहिता, उत्तरतन्त्रम्, ३६, ५७ ।

105. मावान् कपिङ्गलानेषां श्वसोरातुपचक्रकान् ।  
तुरङ्गान् कालपुच्छांश इरिच्छान् पृष्ठतः शशान् ॥  
प्रदद्याच्चांससामग्राय ज्वरिताय उद्धरापहान् ।  
ऐषदखलाननकान् वा रसान् काले विचरणः ॥  
कुञ्जुटांश श्वसूनां तिनिरिक्तीच्छवर्तकान् ।  
गुड्डखलान्नं शंसनि उवरे कैचित्विकित्सकाः ॥

चरकस्त्रहिता, चिकित्साखानम्, २, १६५ ।

tent fever. Milk is restorative in all consumptive fevers; it always produces good result whether drunk hot or cold with whatever medicine prescribed for the particular fever." *Charaka VI. 3.* 196<sup>104</sup>.

"The embrace of maidens that are pretty and well-shaped, relieves the chills of (malarial) fevers, by imparting the natural warmth of their body." *Charaka VI. 3.* 208<sup>105</sup>.

"In old pneumonic or nervous fever, if the patient suffers from chills, heat should be applied to warm him up, which is very beneficial in such a case ..... (drinking of hot concoction, hot wine, warm bath, hot salve and fomentations are recommended)....The body should be covered with warmed cotton or silken clothes. If the

104. सनागरं सख्तीकर्म सदृशीद्वयकर्म् ।  
शतं पथः सख्त्युरं पिपासाज्वरलाशनम् ॥  
चतुर्गुणेनाक्षरा वा शतं उच्चरहरं पथः ।  
धारोचं वा पथः सदृशी बातपित्तज्वरं लयेत् ॥  
जीव्युज्वरादा सख्त्युरं पथः प्रशस्तं परम् ।  
पथं तदुच्चं शोतं वा यथाखैरीच्छेः शतम् ॥  
चरकस'हिता, चिकित्सासामन, ३, १६० ।

105. आदपचित्तगावाय तद्वयो योद्वयोभ्या ।  
चाप्त्वे वाप्त्वमयन्वायु प्रमदाः शिरिं उच्चरम् ॥  
चरकस'हिता, चिकित्सासामन, ३, २०८ ।

patient feels fatigued anoint the body with aloes (*aquilaria agallocho*). And well-breasted, pretty and artful maidens in the first inflorescence of their youth, should massage gently his debilitated body. And the maidens with the face like the autumnal moon, eyes like the blue lotus, long-curved tremulous brows, complexion like molten gold, bright-red lips (like the *bimba* fruit = *memordica monadelpha*), narrow abdomen (slender waist) but broad expansive pelvic region, body anointed with delicate fragrance (*croco saliva* and *aquilaria agallocho*), firm, round and elevated breasts, dressed in fine-smelling, washed and white loose dress, as a wild-creeper (entwines round a tree), should embrace him closely. But when the patient seems to be enlivened, then the maidens should be removed. When by the delightful contact of the maidens, the chills have disappeared, the patient should take pleasant and beneficial diet."

*Susruta VI. 39. 134<sup>106</sup>.*

106.

कफवातीत्यदीयापि उद्वरयोः श्रीतपौष्टिनम् ।  
दिद्धादुधेन वगेण परस्पोषो विधिष्ठितः ।  
सिक्षेत् कोच्छैरारथाल-शुक्लगीभूतमस्तुभिः ।  
दिद्धात् पलाशरथवा सुरसार्जं कथियुवैः ॥  
आरतीलेन चाभ्यङ्गः सशुक्तीन विधायते ।  
पानमारणगृधारेश कथितस्य विशेषतः ॥

*Prophylaxis in malarial fever can be summed up in these words : (a) destruction of mosquitoes ; (b) the prevention of the entrance of the parasite into the human body ; (c) increasing resistance of the body against the parasite.*

As the mosquitoes require shallow, stagnant water for breeding and development of their larvæ, the first requisite for a determined fight against malaria, is the awakened public sentiment against this pernicious and malignant

अवगाहः सुखोच्चय वातप्रकाशर्युतः ।  
 ग्रित्वा शोतं क्रमैरेभिः सुखोच्चजलसेचितम् ॥  
 प्रवेश्यीर्णिंककार्पास-कौश्याम्बरसंहसम् ।  
 शाययेद् खालान्देहस्त्र कालागुरुविभूषितम् ॥  
 सनाक्षा इपसम्पदाः कुशला नवयोवनाः ।  
 भज्ञेयुः प्रभदा गावः शोतदेश्यापहरिभिः ॥  
 शरक्षणाङ्गवदना नीलोत्पलदलेच्छाः ।  
 स्फुरितव्य लालाभङ्ग-लालाटलटकम्पनाः ॥  
 प्रखन्विलसत्काश्चो विष्वीफलनिभाधराः ।  
 कशोदर्थीइतिविक्षीर्ण-जगन्नोइहुनालसाः ॥  
 कुरु भागुरुदिग्धाङ्गो घनतुङ्गपयोधराः ।  
 सुगन्धिधूपितश्च-क्षालागुरुविभूषणाः ॥  
 गाढ़मालिङ्गयेयुसं नरं बनलता इव ।  
 प्रद्वादचास्य विश्वाय ताः स्वोरपनयेत् पुनः ॥  
 तासामङ्गवस्त्रे व-निवारितहिमज्वरम् ।  
 भोजयेत्तिमन्त्रज्वर्यथा सुखमवाप्नुयात् ॥१४  
 सुश्रुतसंहिता, उत्तरार्थम्, २२ ॥

disease. For without communal co-operation, it can not be accomplished. There should be complete surface and subsoil drainage and the ground should, be so levelled by filling up the ditches and the natural depressions that there can not be any accumulation of water for the breeding of the mosquitoes. All the ponds, lakes, canals and water-ways should be deepened, and the water-plants that usually float on the surface as safe breeding place for mosquitoes, protecting the larvæ from the fish must be regularly and systematically removed. Fish should be cultivated in every pond, lake or canal, especially the '*girardinus poeciloides*' which is a voracious feeder on eggs, larvæ and pupae of mosquitoes. All trees on the bank of the water or near the dwelling house which takes away sunshine or interferes with free current of air, should be felled, for the mosquitoes need a dark place to hide in the day time. Laveran recommends the plantation of castor oil plants (*Prophylaxie du paludism*, p. 134), the odor of which he believes drives away mosquitoes. However the promise held by the Eucalyptus tree has been rather deceptive. Bats appear to be voracious feeders of mosquito larvæ.

The next thing is to protect the inhabitants

against the mosquito bites. Mosquitoes can fly nearly a mile's distance from the breeding place, and many of them go out and bite only in the evening and at night. And it is the females that do the biting. The males live on vegetable and fruit juice. The life of a female mosquito is about a month. It bites any vertebrate it might come across in order to get blood which it needs as nourishment for its eggs. But it is only by biting a malarial patient, it can be infected with the malarial plasmodium, which it transmits to others when biting again. Therefore to prevent the spreading of malaria, it is necessary that the inhabitants be protected from mosquito bites, for in a malarial region, almost every one might harbor malarial germ in the blood, though the disease is in a latent form and there is hardly any apparent symptom, excepting a little malaise and lassitude. The mosquito bite can be easily prevented by using mosquito wire netting in the windows, which does not prevent the circulation of air. Where it can not be done, mosquito-nets must be used in the bed. And if it is necessary to go out at night, one should take care to wrap the body in clothes or smear the body with carbolated vaseline and to use a fine-gauze net round the face and neck.

Quinine is the best prophylactic and curative agent against malaria. In the endemic malarial region, it is a wise policy to take 2 to 4 grains of quinine daily, as a preventive medicine, which seems to be much more effective than larger doses at longer intervals. Chlorhydrate of quinine is preferable in an irritant stomach, or Sulphate of quinine can be given which is much cheaper. During the acute stage of the malarial fever, it is better that quinine be administered in doses not smaller than one gram, nearly four hours before the expectation of the chills, as quinine takes nearly four hours to act, and it should act energetically at the time of the sporulation—when the young broods are liberated and which provokes the chill, and the sporules then should be destroyed, for it is very doubtful how far the old gamets are affected by quinine. Quinine should be given every day, preferably by mouth and in powder form or in solution, and the bitter taste can be covered and neutralised by addition of syrup glycyrrhizae (syrup of licorice) every day when the attack is expected, until the disease is broken, as it may be due to double infection by the tertian, estivo-autumnal and quartan parasites or to the treble infection of the quartan. And with the exception of rein-

fection, relapses can be usually prevented by giving quinine once a week for four weeks from the occurrence of the last chill.

During the paroxysm, treatment needs simply to be symptomatic : in chills hot drink, warm covers and hot fomentations can be applied to relieve the shivering cold sensation, and during the succeeding hot period cold application on the head to relieve headache and cold drink to relieve thirst. But the sweating period should not be shortened by antipyretics as it might harm the organism by retaining the malarial toxins which perspiration tends to eliminate, and that is why the sweat of a malarial patient has a peculiar odor.

It goes without saying that nourishing food and hygienic living strengthens the resisting power of the organism against any infection.

## *II.-Diarrhoea.*

"Excessive consumption of indigestible (*alimentary diarrhoea* provoked by the irritation of the intestinal mucosa through the indigestible residue), *fatty* (fatty d. or d. adiposa, caused by the splitting of the fat into irritant fatty acids, or as in jaundice with the deficiency of the bile, by the evacuation of the undigested fatty sub-

stances), dry (mechanical or *serous d.* caused by an augmentation of pressure within the alimentary canal with exaggerated serous transudation into the intestine), hot (*inflammatory d.*), liquid (*asthenic d.* caused by the fermentation brought by the dilution of the digestive enzymes by an exceedingly large quantity of liquid), coarse (*linteric d.* in which the undigested or half-digested food particles are contained in the discharges), ice-cold (*congestive d.* is induced by mechanically stimulating the peristaltic contractions and possibly glandular secretions by a large quantity of cold water, thereby increasing the amount and fluidity of the intestinal contents, and by diluting the gastro-intestinal secretions which interfering with digestion, provokes fermentation ; the drinking of ice-cold water and beverages cause loose movements for they mechanically bring about contraction of the superficial vessels of the mucosa, followed by reaction and congestion of the membrane, and if long continued to intestinal catarrh), and *improper foods* [diarrhoea is provoked by all kinds of food poisoning, *bromatotoxicismus* either putrefactive, fermentative or infective with all toxemic symptoms : meat-poisoning or *kretotoxicismus* arises from decomposed meat (proteus group alone or associated with

colon bacilli), meat of diseased animals or infected animals (as tuberculosis); fish-poisoning or ichthyotoxicosis arises from eating fish that is venomous, or only at the spawning season or from feeding upon putrefactive substances or from its decomposed ptomaine poisoning as in rotten egg; milk-poisoning or galactotoxicosis arises from taking contaminated or spoilt milk: milk may be contaminated from various sources as it is one of the best culture mediums of pathogenic germs, as from tuberculosis from a diseased animal, dust on the animal, filthy hand of the milker, unclean receptacle, or, washed with polluted water, or from exposure when left uncovered for a considerable period, and milk usually contains myriads of bacteria, and in it are frequently observed colon bacilli and bacillus enteritidis, and to a lesser extent bacillus enteritidis sporogenes, staphylococci, paratyphoid and occasionally typhoid germs; grain-poisoning or sitotoxicosis arises from using spoilt, contaminated or sprouting grains, as pellagra in the use of diseased maize, or in the spoilt pea, paraplegia, or lathyrism (*lupinosis*) in the admixture of the grain with the seeds of the '*lathyrus*'; it is well known that sprouting potatoes contain at the mouth of the sprouts or the greenish surface of

the skin exposed to the sun, a glycerid alkaloid-solanine, while many of the mushrooms contain another toxic alkaloid-muscarin], *uncooked food* (uncooked food is not only hard to digest as cooking softens the tissues, but many of the vegetables and fruits might contain fungi, amoeba and the eggs of many intestinal worms which are thus introduced into the alimentary canal where they make their habitat, and provoke diarrhoea either by irritating the mucosa, or causing ulceration or impaction), *disharmonious combination of foods* (as milk and acid, or sugar and acid which is apt to cause fermentation in a weak or debilitated stomach), repeated eating before the former meal has been digested (*adhyasana=d.ab* ingluvie), indigestion (*dyspeptic d.*) excessive use or abuse of purgation, vomiting and sweating (*d. cathartica*), *poisoning* (in chronic mercurial poisoning perhaps due to the corroding action of its salts, there is an extensive ulceration of the alimentary canal, followed by fetid diarrhoea, anemia, foul breath, falling out of the hair, brittleness of the nails, salivation, stomatitis, buccal ulcers and enterocolitis; in acute or chronic arsenic poisoning, there is pronounced epigastric and abdominal pain, followed by vomiting and diarrhoea

of rice-water and often bloody and offensive stools, suppression of urine or bloody urine, neuralgic pains and paralysis ; in lead poisoning, the gums have a bluish black tinge, progressive anaemia, nutritive disturbance, constipation, but often alternating with diarrhoea), anxiety (*emotional d.*) depression (nervous or *neurotic d.*) *polluted water* (water containing dysenteric germs or large amount of earthly alkali as magnesium or sodium, calcium or potassium carbonates, dissolved from the soil) excessive drinking of *spirituous liquor* (in chronic alcoholism diarrhoea results from the thickened, inflamed, congested and often ulcerated intestinal mucosa, imperfect gastro-intestinal indigestion, interference with colonic absorption, disturbance of the biles due to congestion and cirrhosis of the liver, and the effect of alcohol upon the local and cerebro-spinal nerve-centres controlling intestinal nutrition, secretion and motility, thus provoking diarrhoea alternating with constipation), mental derangement (*neurogenic d.*), sudden seasonal changes (*thermic* or *summer d.* of the hot season : it may be also induced by sun or heat stroke accompanied by enervation, dizziness, cramp, disturbed vision, dry skin, rectal and vesical irritability ; in exposure to

cold and dampness, the surface of the body is suddenly chilled with the lowering of the surface temperature, which causes the contraction of the cutaneous blood-vessels, leading to congestion of the internal organs, chiefly the intestine and viscera, and reflexly irritating the motor and secretory nervous mechanism—thus leading to evacuations ; in sudden change of climate, diarrhoea may be, also, induced as hill or spruce d.), excessive use of lavage (*mechanical d.*), *obstructive* (due to carcinoma, tumor, calculi, fecal impaction or obstruction of the passage with the tapeworms as *tenia solium* which is introduced with incompletely cooked pork and might grow from 6 to 12 feet, *tenia saginata*, from incompletely cooked beef varying in size from 10 to 25 feet, *tenia lata* from half-cooked fish varying in size from 5 to 25 feet, and *tenia nana* (dwarf tape) from one-fifth to one and one-fourth inches in length ; diarrhoea is provoked by them either because the formed feces can not pass through the obstructed passage and only watery liquid can ooze through, or due to irritation from the mucosa caused by them ), and by '*krimis*' [worms *uncinariasis* or hookworm, *ascaris lumbricoides* or round worms, *oxyuris vermicularis* or thread-worm, *tricuris trichiura* or whipworm, *trematodes*

or flukeworms and strongyloides intestinalis ; microbes : entamebazer rhizapodes in amebic dysentery, flagellates ormastigophores in flagellate dysentery, ciliates ( balandium coli, infusoria ) in ciliar dysentery, bacillus dysenteriae in bacillary dysentery, spirillum cholera asiatica in cholera, bacillus typhosus in typhoid fevers, gonococcus among the pedestrians with extensive lesion of the anal mucosa, plasmodium in biliary remittent fever ] these causes produce diarrhoea." *Susruta* VI. 40. 2<sup>107</sup>.

"Slow-moving (*ajava*=ascaris), agile (*vijava*=flagellates), creeping (*kipyā*=trematodes or flukeworm), stealing (*tripyā*=uncinariasis or hookworm), knotted-feet (*gaṇḍū-pada*=tenia), thread-like (*churu*=oxyuris vermicularis or thread-worm) and two mouthed (*drimukha*=trichuris trichiura or whipworm) are the 'krimi' (parasites) of the feces ; they are whitish and minute ; they move in the lower intestine and cause (bor-

107. गुर्जतिकिरथक्षेत्र-द्रवस्थूलातिशीतलैः ।

विद्याप्यवनाजीर्णं विषमेशापि भोजनैः ॥

चेत्याद्येरतियुक्तं च मिथ्यायुक्तं विषाद् भयात् ।

शोकाद् दृष्टाम्बद्यातिपानात् साक्षात् पर्यात् ॥

जलाभिरभवेद्देव-विषादैः क्रिमिदोषतः ।

इनां भवत्यतोषादो वचनं तस्य वचनाते ॥१२

सुश्रुतस्त्रिता उच्चरत्वम्, ४० ।

ing pain ; and among them there are some that have flagella *puchcua* as in flagellates) and they are broad. These fecal 'krimi' (worms and other microbic parasites) bring about colics, dyspepsia, jaundice, intestinal obstruction, weakness, over-flowing of the watery discharges, heart lesion and non-formation of the feces."

*Susruta VI. 54. 4<sup>100</sup>.*

"The prodromes of diarrhoea are boring pains in the heart, umbilicus, coccygeal region, abdomen and the groin, lassitude of the body, flatulence, constipation, tympanites and indigestion." *Susruta VI. 40. 4<sup>100</sup>.*

"Abdominal pains, oliguria, sounds in the alimentary canal, prolapsus ani, lassitude of the

108. अजवा विजवा: किष्यालिप्या गच्छ पदासथा ।  
चुरवी विसुखाये व सहै चैते पुरीषज्ञाः ॥  
नेत्राः सूक्ष्माद्यन्ते ते गुदं प्रति सरनि च ।  
तेवाभिवापरे पुच्छः पृथक्य भवनि हि ॥  
गूलाप्तिमाद्यापारुत्त-विष्टव्यवलस्तच्याः ।  
प्रसेकादचिह्नद्वोग-विष्टमेदात् पुरोषज्ञैः ॥४  
सुशुतस्त्विता, उचरतम्बन, ४० ।

109 इत्याभिपायदूरकुचितोद-गावावसादाग्निक्षेपितोधाः ।  
विट्साऽपाचाणमयाविपाको भविष्यतस्तस्म मुण्डसराचि ॥४  
सुशुतस्त्विता, उचरतम्बन, ४० ।

groin, thigh and the knee and the evacuation of mucus-covered (*saphena* = frothy) dark-brownish, hardened scybla in small quantities with gas—these are the symptoms of nervous ( dysenteric) diarrhoea.

"Dark-yellowish ( in biliary obstruction ), greenish (due to the presence of unchanged bili-verdin in the discharges as in acute enteritis), or reddish (tarry stools may be due to cancer or ulcer of the intestine or dysentery), unformed, serous (like the juice of pressed meat), foul-smelling and steamy discharges rush forth in bilious diarrhoea (cholera asiatica) ; in this disease the patient becomes exhausted and becomes over-powered by polydipsia, vertigo and hyperemia of the internal organs.

"Whitish (rice-water, or containing undigested fat) and pasty stool appears noiselessly, mixed with mucus in phlegmatic diarrhoea ; in this disease the patient suffers from collapse, somnolence, lassitude and repeated evacuations ; and the patient becomes irritable and there is horripilation (contraction of the peripheral vessels).

"In the typhoid fevers, the above mentioned symptoms appear, but the color of the evacuation is varied and the patient suffers from polydipsia ; it is very hard to cure and the prognosis is especi-

ally unfavorable for the infants and for the aged." *Susruta* VI. 40. 5-8<sup>110</sup>

"If in cholera asiatica (*visūchikā*) and tymphenites (*alasaka*), the teeth (the gum), lips and nails become cyanotic, there is a comatose state, active vomiting, orbits of the eyes are sunk in the sockets, the voice becomes weak and the

110.

श्लाविष्टः सक्षम्बोद्धव्याजो  
 अस्तापात्रः सप्रकटूर्जगङ्गः ।  
 वर्णो मुखल्यत्यभव्यं सफेनं  
 दुर्घं श्वासं सानिलं माहतीन ॥५  
 दुर्गं न्युराणं विगवन्नासतीय-  
 प्रख्यं भिन्नं लिप्रदेहोऽतिरप्यः ।  
 दिनात् पौत्रं नोलमालोहितं वा  
 तच्चामूर्छादाइपाकज्वरात्मः ॥६  
 तन्द्रालिङ्गात्रोत्स्फुर्षसादी  
 विगाशहो उष्टविट्कोऽपि भूयः ।  
 शुक्रं सान्द्रं श्वेयथा श्वेययुक्तं  
 अक्षाद्वीषी निःखनं छटरोमा ॥७  
 गद्वायुक्तो भोडमानासयोषो  
 वर्षः कुर्यात्त्रै कवर्णं दशात्मः ।  
 वर्णोऽङ्गूतः सर्वलिङ्गोपपतिः  
 छक्षयायं वालहृष्टवसायः ॥८

सुदुतस १६८, उत्तरवद्व, ४० ।

joints become relaxed, then the prognosis is very unfavorable." *Susruta VI. 56. 8<sup>111</sup>*.

"In acute diarrhoea, if the feces is formed or shows symptoms of being formed, and the vitality of the patient is not very low, there has not been much emaciation of flesh nor blood much thinned, appetite and digestion have returned, then the patient can be cured with difficulty. But if the patient has the following symptoms, notwithstanding the above-mentioned presentations, he is to be regarded as incurable. Incurable symptoms are being mentioned : if the stool has the color of concoction (dark-brownish), reddish, like that of the spleen and fat ; or is (in consistency) like water in which meat has been washed, curdled milk (semi-fluid), clarified butter, bone-marrow, oil, butter, milk, condensed milk, or deep bluish (with the development of indican in pronounced putrefaction), reddish, blackish (in bilious remittent or black-water fever), or transparent like water or the brownish-black color of the banana flowering-stem (clay or chocolate color stool appears in

111. यः म्लावदस्त्रीडगक्षोऽस्मद् च अहर्गृहिं तोऽभ्यक्तरयातनेदः ।

चानलः वर्जविमुक्तसम्बिर्यावान्नरः सोऽपुणरागमाय ॥८

तुनुतष्टुहिता, उत्तराकान्, ५५ ।

absence in *urobilin*, that is in the deficiency of the biliary secretion in the intestine), very fatty, pale-greenish or dark-greenish (due to unchanged biliverdin), or multi-colored; or is turbid, lubricous or mixed with thread-like substance (*oxyuris vermicularis* or thread-worms), mucus or like the ocellate spots on the tail-feather of a peacock (flakes); the odor is like that of a decomposed corpse (cadaverous), putrid, pyogenous or like raw fish (fishy); if the feces attracts quickly the flies, or various viscid substances are observed in it (the stool may contain undigested food, blood, mucus, pus, membranes, fat; calculi from the gall-bladder, intestines, stomach, salivary glands; intestinal parasites, exfoliated polypi and nerotic sloughs), or the discharge contains very little feces (a normal stool should have hard but flexible consistency, golden-brownish in color, cylindrical in form, nearly an inch in diameter, three to four inches in length; but if it is of small calibre, it is indicative of prolapsus ani or an annular stricture of the rectum; ribbon-shaped or flattened stool of stricture or cancer of the rectum; roundish masses of hardened feces (*scybala*) may shoot out in dysentery or is indicative of the gastric ulcer, gastric dilatation, cancer of the rectum or chronic constipa-

tion) or is free from it (*serous*) and the patient suffers from polydipsia, hyperemia of the internal colics or its insensibility to pain ; if there is anal fistula or ulceration, or hemorrhage of the pile or the pile does not go back to its own place, stricture of the anus, emaciation of the body, thinning of the blood (anemia due to the reduction of the red corpuscles), pain in the lumbar region, anorexia, morbid delirium and coma, or the diarrhoea suddenly ceases, that patient is to be regarded as incurable." *Charaka VI.* 19. 11<sup>112</sup>

"In the first stage of diarrhoea, fasting is beneficial. After fasting, for relief from diarrhoea barley water should be given with (astringent) concoction (*pāchana*). If patient still suffers

112. महट् ग्रथितमानं शङ्खदपि वा पक्षमनतिक्षीणमांसग्रोचितवलो मन्दापि-  
द्विष्टमुख्यरसस्य तादृशमातुरं क्षक्षसाध्यं विद्यात्। एभिर्वर्णरतिसार्थमाण्यं स्त्रोपद्रव-  
मातुरमसाध्योऽयमिति प्रत्याचर्षीत। तद्यथा—६.. यशोचितामं यक्षत्पिण्डीपमे मेदो-  
मांसोदकसहगं दधिष्टमव्यतैख्यवसाचौर-वेशवाराभमतिनील-भतिरक्षमतिक्षीणमुदकभि-  
वाच्छं पुनर्जेचकाभमतिक्षिग्रं इरितामं नीलकषायवर्णं क्वचुरवर्णमाविलं पिण्डिलं  
तत्त्वमदामं अन्द्रकोपगतमतिक्षुण्यप्रूतिपूर्यगम्याममत्सगस्ति ग्रचिकाक्षाळं क्वथितवह-  
धातुक्षावमन्यपुरीषमपुरोषं वातिसार्थमाण्यं दृष्टादाहज्वरमतमोहिक्षाशासानुवमति-  
वेदनमवेदनं वा वक्षपक्षगुदं पतितगुदवलिं मुक्तामालमतिक्षीणवलमांसग्रोचितं सर्व-  
यज्ञविद्युत्यग्निलिङ्गमरोचकारतिप्रकापर्वत्मोऽप्यरीतं सहसोपरतविकारमतिक्षारित्मचिकित्स-  
विद्यादिति सन्निपातातिसारः।

चरकवंडिता, विकितसारागम, १६।

from colics and flatulence, give him an emetic with piper longum (which is carminative) and rock salt, dissolved in water. After vomiting light food can be given, barley water and piper longum. But if this does not relieve diarrhoea then every morning a concoction of turmerics (*curcuma longum*) or sweet flag (*acorus calamus*) should be given to drink." *Susruta* VI. 40.16<sup>113</sup>.

"In morbid diarrhoea (dysentery) and strangury, a (rectal) enema (*vasti*=clyster) of concoction of liquorice root (*glycyrrhiza glabra*) and blue lotus (*nyphaca cacrula*) mixed with milk, clarified butter and honey (for irrigation) should be given ; hemorrhagia proctica, aesus and fever are also relieved by this enema. If there is bloody stool an oily enema of soothing and honeyed herbs should be given daily either

113. तत् लक्ष्मनमिवादी पूर्वजुपेतु देहिनाम् ।  
 ततः पाचनस्युक्तो यवाग्नादिक्रानो हितः ॥  
 अथवा बालयित्वा तु ग्लाभानग्निपोषितम् ।  
 पिप्पलीस्यभवाश्चोभिलं कृत्यादीक्षपादरेत् ॥  
 कार्यच्च वसनसामने प्रायश्चो लघुभोक्तव्यम् ।  
 स्तुद्युवयवाग्नु पिप्पलादेव योजयेत् ॥  
 अवेन विधिना चाम यस्य वै गोपशास्यति ।  
 नरिद्रादिं वसादिं वा पिवेत् प्रातः स नानवः ॥१६  
 मुशुतस्यहिता, उत्तरतत्त्वम्, ४०, १६ ।

at day or at night. An oily enema relieves the nervous irritation where it is administered ; and if the nerves are subdued, the dysentery is also cured." *Susruta VI. 40. 90<sup>114</sup>*.

Rectal irrigation with soothing oil or sterilizing medical solution or their combined emulsion is certainly one of the best means known to combat pernicious, ulcerated and resistant diarrhoea and is very effectively utilized in advanced modern treatment. Enemas serve to dislodge or to prevent fecal impaction where ulcers have healed and a stenosis has formed in the lower bowel, and for evacuating gas, putrefying matter, toxic discharges and other irritants within the rectum. An enema is generally given in constipation. And in an enema the fluid administered has to be limited to two to three quarts or it might cause distension, pain, ptosis

114. महाराजे शूवक्षङ्के भिवन्वति प्रदापयेत् ।  
पथोनभुष्टोन्मिथं नभुकोत्पथसुधितम् ॥  
स ग्रस्तः शमयेत् तस्य इत्यं दाहमयो ज्वरम् ।  
नभुरौपथसिद्धम् हितं तस्यानुकासनम् ।  
शावावहिनि वा नित्यं रजातों यो भवेद्वरः ॥ ६०  
यथा यथा सतीतः स्यादातश्चानि साथा तथा ।  
प्रशान्ते नार्कते यापि शृण्णि याति प्रवाहिका ॥  
सुशुतसु-इता, उत्तरतम् ४० ॥

or paresis of the intestine and in severe cases even the rupture of its membrane. While in irrigation, there is no limit to the quantity of fluid, for the solution is allowed to flow into and out of the gut through a double or return-flow tube (*irrigator*) or by making the fluid flow into the bowel by way of an artificial opening (*appendiceal or cecal*) and making it flow out at the anus through a proctoscope or a pipe introduced for the purpose, thus escaping as fast as the solution enters into the bowel. Therefore irrigation serves by the soothing and antiseptic properties of its content to heal the local ulcerated lesions, prevent the formation of impacted fecal masses, to wash out the sores and to neutralize the toxins, to remove toxins, irritating pus, blood, mucus, tissue debris and feces, to dislodge and wash away parasites, and to relieve enterospasm, colics and tenesmus. By *vasti* is meant to include the functions of an enema and irrigator according to the needs.

Improvement invariably follows *daily irrigation* of the intestine. But it is not so much due to the medicaments as to the dissolvent and cleansing quality of water and washing away the toxins, so that the organism does not suffer so much from their absorption. Undoubtedly

antiseptic, deodorant, soothing and stimulating medicaments exert beneficial influence, especially in inflammatory, ulcerative and obstructive lesions of the intestine, but they are only of secondary value. The only thing that is important is to irrigate the intestine as often as possible with body temperature of the solution. Positive good result is obtained by daily irrigation with warm saline solution, camomile, flax-seed, oak-bark tea, pinas canadensis (1 p. c.), borolyptol, potassium permanganate, glyco-thymolin or listerin (3 p. c.), salicylic acid, alum, zinc sulphate or silver nitrate (1 p. c.), boric acid or Carlsbad salt (2 p. c.) or thymol (1 : 2000). In advanced cases of deep-seated ulceration and erosions, it is better to use the above solutions a little stronger or ichthiol or balsam of Peru (2 to 5 p. c.), salicylate of soda (3 to 5 p. c.) and bisulphate of quinine (1 : 1000) especially in entamebic and bacillary dysentery. Oils named according to the degree of their proven usefulness, olive, sesame, sweet almond, cotton seed, liquid vaselin and neutralol, either alone or in emulsion with the above-mentioned medicaments, can be used with marked result.

*Propylaxis :* As water seems to be the principal source of infection of cholera asiatica,

typhoids and dysentery, and in water spirillum cholera asiatica, bacillus typhosus and pathogenic agents of dysentery (*entameba dysenteria*, *bacillus dysenteria*, *bälantidium coli*) can all live and thrive for a long time, it is essential that all drinking water must be thoroughly boiled and filtered. Milk also must be boiled before it is drunk, as it is often contaminated by water from suspicious sources. All dejecta from the victim of any of these diseases must be disinfected with a five per cent solution of carbolic acid, one per cent of chloride of lime or one-fortieth per cent of corrosive sublimate, so that all the pathogenic microbes be destroyed and they can not enter into the soil, especially if it be saturated with moisture where they can multiply, and retain their vitality and virulence for years. This also applies to urine and sputum. Nor should any vegetable or fruit be eaten raw or not thoroughly cooked which might have grown on the soil or fallen upon it, where there is the least possibility that the soil has been fertilized by human feces. And all coarse vegetables and unripe fruits which might leave a good deal of irritant residue, should be avoided. It is true that these germs have been found living in harmless, inert vegetative state without

provoking any lesion in the gastro-intestinal tract where they have been harboured, and the predisposing cause of their development is the malnutrition, fatigue, over-work and exhaustion of the organism. Yet it must be admitted that it is very dangerous to sustain such potential enemies.

In the treatment of *typhoid and choleraic diarrhaea*, there are two fundamentally opposed theories. One is the destruction and removal of the vibrios and to neutralize the toxins by a powerful antiseptic purgative like calomel ( 3 to 5 grains with 6 to 12 grains of sodium bicarbonate ) and after this initial dose to administer small doses ( one-tenth to one-twentieth grain ), every half or quarter hour until the symptoms improve or the patient passes into algide stage. Some strongly recommend the administration of castor oil ( half an ounce emulsified with chloroform ) before giving calomel. And to inject saline solution ( 1.25 per cent solution of salt, prepared by dissolving 2 drachms of salt in one pint of water ) at blood temperature, ten to fifteen ounces every half an hour to counteract the circulatory disturbance through the evacuations.

The other theory is to spare the vitality of

the patient which is seriously dissipated by repeated evacuations, and for this purpose a strong astringent like tannic acid (*kino, catechu, rhatania* are to be preferred to pure tannic acid) should be introduced into the rectum one to two litters daily in one per cent solution at a little above the body temperature. This seems to have shown good result. And if there are evidences of toxic accumulation and fecal retention, calomel is to be given every two hours in doses of 0.03 to 0.05 gram. The patient must be confined to bed. The body should be kept warm by fomentation. To quench thirst, sterilized water should be given, preferably acidulated with the juice of pomegranate, but any other fruit juice or milk under no circumstances. During convalescence pigeon, dove or chicken broth with rice, with aromatic but non-irritant spices is to be preferred, but all coarse and irritant food should be avoided.

In *puerperal diarrhœa (sutikā)* which is usually caused by the invasion of the blood by the streptococci, staphilococci, united with gonococci, coli bacilli and other micro-organisms through a wound of the uterus at child-birth or in miscarriage by careless, septic handling and spreading of the germs, treatment should be

more or less confined to increase the resisting power, bacteriolytic and agglutinative functions of the blood by dietary and hygienic regulations. The symptom-complex of septicemia (*sutikā*) commences usually within a week after infection. At the onset there is chilliness with low and moderate fever, but which rises and tends to become of continued type with decided daily remission. If however pyogenic germs have also got admission into the blood, the fever sets in with rigor, there is high temperature with steep curve and daily remission with sweating like malarial remittent fever. However, the fever runs an irregular course. But it may be complicated by previous or post malarial infection. As compared with septicemia, pyemia exhibits recurring chills, deeply remitting fever and sweats, rapid wasting and moderate icterus ; while in septicemia the chilliness is only felt at the onset of the fever which runs a mild continuous type with no sweats and jaundice is much lighter. Headache, marked anorexia, nausea and diarrhoea are the usual symptoms of septicemia (*sutikd*). The pulse is rapid, small and compressible. The spleen may be palpably swollen ; petechial spots are not uncommon ; rashes or herps might also appear. Slight toxemic jaundice is also

usually seen. The urine usually contains albumin, leucocytes, red-cells and tube casts. The leucocytes are increased and there is an immense destruction of the red-corpuscles of the blood, leading often to hemoglobinemia and hemoglobinuria. Loss of appetite is very pronounced and there is no desire to partake of any kind of food and there is a special disgust to meat. The stool is emptied with severe tenesmus and consists of mucus mixed with blood. Often the joints become painful and swollen, and the skin of those parts reddish. Respiration is rapid but there is no dyspnea. But there may be complications of bronchitis or pneumonia.

Prognosis is not very favorable except in cases where within 6 to 8 weeks the temperature, respiration and pulse slowly tend to be normal. The treatment should chiefly consist of hygiene and dietary. The patient must be confined to bed. All movements should be restricted as much as possible, as movement tends to spread the infection. Even after convalescence has set in, the patient shall remain in bed, at least for four weeks and all physical motion and mental excitement should be forbidden. However it is very desirable that the room is airy, bright and cheerful, so that there is no oppressive dullness.

and monotony. Food should be varied, easily digestible, appetizing and nutritious. However, all irritating spices must be avoided though aromatic and sweet-smelling substances can be added with advantage, with only exception to old wine which is very well tolerated in '*sutikñ*'. Meat broth of pigeon, dove, chicken, tender goat or lamb ( from lamb, fat should be taken out ) is very useful in fighting this tragic malady which pitilessly transforms the long-dreamt happy motherhood into painful suffering and sad struggle for life. Lean, light fish can be given in any appetizing way, but fatty and heavy fish should be avoided.

Antistreptococcic serum which is calculated to destroy the bacteria either by producing agglutins or phagocytosis can be injected three times daily with promising result unless there is pyomia, in which case it is apt to do positive harm according to Menzer whose serum has good reputation for its efficacy. The inunction of unguentum is claimed by Crede to be beneficial. But none of these preparations have given completely satisfactory results. They are more or less empirical. The antipyretics are recommended by some.

But as fever is the expression of the bodily

reaction against the toxic products of the invading micro-organisms, suppression of fever is apt to do rather more harm than good unless absolutely necessary to reduce the temperature and relieve certain nervous symptoms. Moreover all the antipyretics—antipyrin, phenacetin, acetanilid, malakin, kryofene, lactophenin and others are all coal-tar products. And the use of these drugs is followed by depression and sometimes serious collapse. Therefore its repeated use in continued and prolonged fever might endanger the life of the patient by heart failure which is seriously damaged by this disease, though the temperature of fever is thereby reduced. Quinine of course in non-malarial septicemia, is hardly of any value. Only it is very useful when '*sutikā*' is complicated by malarial infection.

*Prophylaxis* in '*sutikā*' is the absolute aseptic handling at every child-birth, for otherwise with least wound or abrasion of the female genital organs which is inevitable, circulatory system may be invaded by pathogenic micro-organisms through lymph channel or veins. All the instruments must be thoroughly sterilized, and sterilized glove should be used. Genital organ also should be carefully examined before delivery

for any infectious disease, especially gonorrhea. In case of gonorrhea all precautions must be taken and the baby's eyes should be washed with one to two per cent silver-nitrate solution, or better still—Argyrol in 1-50 to 1-20 solution to prevent the affection of the eyes with its virus (*ophthalmia neonatorum*).

### *III-Diabetes.*

"The causes, lesions and the organs that are affected which provoke temporary (alimentary) diabetes are as follows: too often an excessive consumption of various kinds of new cereals, bean-broths (of new *pisum sativum* and *phaseolus roxburghii*) seasoned with clarified butter, meat of animals and amphibious creatures, vegetable-leaves, sesame-seeds, rice or wheat cakes, rice-pudding, rice and lentil curry, puff-corn, sugar-cane-juice, milk, fermenting milk, fluid-food, sweet-meats and the intemperate eating of other products which are phlegmatic (reduces metabolism), fattening and diuretic—they are etiologic factors of diabetes (that is, the excessive consumption of carbohydrates in various forms above the assimilative power of the organism). Excessive liquid phlegma is the pathological production and abnormal accumulation of fat, flesh, per-

spiration, (production of) semen, blood, marrow, lymph, chyle and lecithin (*oja*) are the predisposing causes ( become affected ) "Charaka II. 4. 3<sup>116</sup>.

There are *various kinds of diabetes* : "The urine is whitish, painless (micturition) and aquatic in '*udaka-meha*' [*diabetes inepidus*, in which the quantity of urine is enormously increased ( 10 to 30 pints), it is light-pale in color and the specific gravity is low (1.002 to 1.007) ; the total urea output is slightly increased, but it does not contain albumin, sugar or casts ; only inosite ( muscle-sugar ) is met with on rare occasions. Except excessive thirst and loss of fluid, the patient otherwise might be in apparent good health. This disease is supposed to be of nervous origin] ; the urine is (sweetish) like the

115. तदेवी वयो निदानादिविशेषाः श्वेयनिमित्तानां प्रमेहाद्यामार्द्धभिन्नं ति-  
करु भवति, तद धूषा शायनकथयक्तव्योनकोऽहातसर्वप्रथेत्कटमुकुन्दक-महाग्रीषि-  
प्रमोदकसुगम्यवानां नवाप्नानामतिवेलाप्रतिप्रमाणेन वोपयोगः, तदा सविधता नवहरेच-  
मादस्थ्यानां वाम्बान् पीदकानपि नांसानां आकातिलपवलपिष्ठान्नपाथसक्तभवित्वैपौष-  
विकाराणां चीरमन्दकदधिद्रवमधुरतद्यज्ञप्रायासामपुरपयोगः, मृगाव्याधामवर्ज्ञं ते, सप्त-  
श्वेषाम्बुद्धप्रसङ्गो यः कवचिदिधिरन्वोपि श्वेयसिद्धीमूलजननः स उद्यो निदानविशेषः ।  
वहुद्वयः श्वेषा दोषविशेषो, वहुद्वयं मेदो नास्त्र शरीरजलोदः युक्तम् शोषितं वसा नजा-  
कसीका रससीका इति संस्थाता दूषविशेषाः ।

sugar-cane juice in '*ikṣu-meha*' (*diabetes mellitus* or glycosuria in which the urine contains one to ten per cent of glycose, is pale, acid and has a sweetish odor ; the quantity of urine is greatly increased (5 to 20 pints) and is usually of high specific gravity (1.030 to 1.045) ; urea is increased and in advanced stage of the disease acetone, diacetic and B-oxybutyric acid may be present. This disease is due to the lesion of the pancreas which seems to control the carbohydrate metabolism) ; the urine is like spirituous liquor in '*surā-meha*' [*acetonuria* in which a large amount of acetone is excreted with the urine, indicating incomplete oxidation of albumines and fats, especially in absence of carbohydrate which is needed for their complete combustion. Acetonuria is met with in inanition, typhoid fever, pneumonia, acute miliary tuberculosis, acute rheumatic fever, cancerous cachexia, intestinal auto-intoxication, septicemia and in diabetes, especially when sugar is completely withdrawn from diet for some time or sugar metabolism is disturbed. Acetone is a colorless mobile liquid of pleasant odor, produced commercially by the destructive distillation of acetates (whence the name '*pyroacetic spirit*'), and of sugar, cellulose and various organic compounds.

Acetone is the simplest representative of the aliphatic ketones and is known as '*demethyl-ketone*'. It has some anesthetic quality and smells as ether. Pure alcohol when ingested in excess or under certain pathological condition of the alimentary canal passes with the urine (A. Ronchese : *L'analyse des urins*, p. 306) ; urination is painful and the urine contains sand-like minute but hard and angular crystals (uric acid sands) in '*sikatā-meha*' (*gravel*—very small concretions, usually of uric acid, calcium oxalate or phosphates, are formed in the kidney and pass through ureter with the urine) ; repeated micturition of phlegmatic (colorless, jellylike) and viscous substance in '*śanairmeha*' [*fibrinuria* in which a colorless sticky sediment (*coagulum*), or if much febrin is present, the conversion of the urine into a jellylike mass upon standing takes place. It is due to the presence of fibrinogen and a ferment capable of forming fibrin. It occurs in cases where the plasma of the blood enters some portion of the urinary tract, as in chyluria, croupous inflammation of the tract, villous growths in the bladder] ; the urine is clear and saline in '*lavāṇameha*' (*chlorides* are normally present in the urine and are daily excreted from 8 to 10 grams ; but a persistent increase of 15 to 30

grams occurs in the prodromal stage of general paroxysm and diabetes insipidus, during convalescence from lobar pneumonia and post convulsive stage of epilepsy) ; there is horripilation ( peripheral contraction) and the urine is whitish like thick rice-paste water (*albuminuria* occurs in acute nephritis, chronic parenchymatous nephritis and urethritis) ; the discharge is turbid and thick in '*sāndra-meha*' (*gleet* in chronic urethritis causes a thin whitish discharge, but becomes, also, thick and yellowish under various causes. The origin of the discharge is the numerous mucous follicles, lining that portion of the urethra corresponding to the site of the chronic inflammation. When congested, granular or abraded patches exist, there is a constant hyper-secretion of mucus or muco-pus with exfoliation of the epithelium upon the surface of the lesion. In this condition the current of urine, as it passes over the diseased portion of the canal, rolls up into strings or threads the desquamated epithelium and muco-purulent deposit upon the surface and this appears in the urine as the delicate thready filament which is a familiar occurrence in chronic gonorrhea) ; the discharge is like the semen in '*sukra-meha*' (*spermatorrhea* is indicative of self-abuse, excessive coitus, sexual neurasthenia

as cause or consequence, and prodrome of locomotor ataxia. Sedentary habits, an habitually loaded rectum, ascarides, and the too free use of condiments and liquors may be responsible for the slighter degree of the symptom. In a continent individual involuntary emissions during sleep, if occurring at intervals of 2 to 6 weeks, are quite normal. But if it be much more frequent and if the emissions occur without erection, unconsciously to the patient, in the day time or while straining at stool, their pathological character is marked. Spermatozoa are found in the first urine passed after emission in men. They occur also in some cases of injury or disease of the spinal cord. Occasionally a small amount of semen is expressed from the vesiculae seminales by the pressure of hard fecal masses, during severe expulsive efforts accompanying obstinate constipation. The persistent presence of spermatozoa in the urine is symptomatic of spermatorrhea) ; scanty foamy urine in '*phenameha*' (in renal congestion, the urine is scanty, acid, of high specific gravity and usually cloudy with urates).

The urine is frothy, transparent and bluish (*indicanuria* in which indican is found in large

quantity. When albuminous substances undergo bacterial putrefaction in the intestine, or are rapidly decomposing in any part of the body, as in the putrid pus of septic peritonitis, or in empyema, indol is formed. When the indol is absorbed, it is oxidized, forming indoxyl, and the latter combines with the preformed potassium sulphate to become the conjugate potassium indoxyl-sulphate, or as it is more commonly termed '*indican*'. If indican which is itself colorless comes in contact with acids or oxidizing agents, it is decomposed with the formation of indigo blue. An excessive formation of indican is indicative of abnormal intestinal putrefaction. As a rule, it is usually associated with hypo-chloro-hydria, as hydrochloric acid exerts restraining influence on proteolytic bacteria. An excess of indican is found in gastric cancer and peritonitis ; the micturition is painful and the urine has the color of turmeric (curcuma has yellowish-brown color ) in '*haridrā-meha*' (*choluria* in which the urine is yellowish-brown or greenish-yellow due to the presence of bilirubin in the urine. It occurs in many diseases in which an excessive quantity of bile is excreted as bilious remittent fever and part of it appears unchanged in the urine) ; sour odor and sourish taste in '*amla-*

*meha'* (*oxaluria* in which there is a persistent excretion of oxalates. Normally oxalic acid is excreted daily from 0. 010 to 0. 020 gram ( one-sixth to one-third grain ), but exists in combination as calcium oxalate, and is held in solution by the acid sodium phosphate of the urine, and when the latter is deficient, the oxalates are precipitated. Oxalic acid is increased by certain foods, as cabbage, rhubarb, tomato, and to a lesser extent by asparagus, spinach, carrots, string beans and celery. Oxalic acid may also result from oxidation of uric acid or an incomplete oxidation of carbohydrates, in which case the intermediate product is oxaluric acid. A persistent increase in the excretion of oxalates is usually associated with the disorders of the gastro-intestinal tract or neurasthenia ); the urine is like pressed alkaline water from ( laundry ) cloth, in smell, color, taste and touch in '*kṣāra-meha'* (*phosphaturia* in which a considerable amount of earthy phosphates mixed with fixed alkali is excreted with the urine. It is found in dyspepsia and neurasthenia. Occasionally the fixed alkali and the earthly phosphates deposit their sediments in the bladder, and the few whitish drops passed at the end of urination like semen, may be their symptomatic

expression. The urine is decidedly alkaline. Normally phosphoric acid is daily excreted from 2 to 3 grams ( 30 to 45 grains ) in combination as alkaline and earthly phosphates, the alkaline salts predominating. It is derived from the food and partly from the decomposition of lecithin and nuclein. The excretion is greatly increased in leucemia, pernicious anemia, nervous dyspepsia and considerably diminished in intermittent malaria, pulmonary tuberculosis with high temperature, typhoid, nephritis, chronic rheumatism and yellow atrophy of the liver ); the urine is like the water of Indian madder (*mañjisthā = rubia munjista*, which has bright red color in '*mañjisthā-meha*' (*hemoglobinuria* in which the urine contains the blood-coloring matter '*hemoglobin*' and its oxidation product '*methemoglobin*'). Hemoglobinuria occurs in cases where there is such an extensive destruction of the erythrocytes that it exceeds the power of the hepatic activity to transform the whole of the liberated hemoglobin into bilirubin, and the excess escapes by way of the kidney with the urine. It is found in pernicious bilious remittent malarial fever, especially after excessive doses of quinine, syphilis, yellow fever and severe form of jaundice); and the urine is like the blood in

*'sonita-meha'* (*hematuria* in which the red-corpuscles of the blood appear in the urine. It occurs in cases where there is an acute congestion of the kidney and the number of erythrocytes indicates the severity of the lesion. Bloody urine may be voided in leucemia, hemophilia, purpura, and in renal cancer, tuberculosis, abscess and lithiasis).

The discharge is like clarified butter in *'sarpi-meha'* (*pyuria* in which the pus appears in the urine. It may be due to different causes, but often it is associated with the gonorrhreal urethritis. The urine containing the pus from any renal lesion is usually acid and from the bladder alkaline); the urine is fatty in *'vasā-meha'* (*lipuria* in which the fat is present in the urine in such quantities as to enable its identification by the unaided eye. The fat may appear in the urine due to the ingestion of excessive amounts of fat (fat meat, or in cases of fracture involving the bone marrow and causing fat embolism, in long-continued suppurative processes, in the lipemia of diabetes mellitus, from the fatty degeneration of the renal epithelium in chronic nephritis, of pus cells, in pyonephrosis or neoplasm along the urinary tract, or in the fatty degeneration in phosphorus poisoning. If the urine is so crowded with minute fat globules as

to present a milky appearance to the naked eye, it is called 'chyluria' or 'galacturia'. Chyluria is usually due to parasitic origin, especially due to the presence of 'filaria, sanguinis hominis'); the urine is in taste and color like honey-sugar (*kṣaudra* = fruit-sugar, that is levulose) in *kṣaudrameha*' (*levulosuria* in which levulose appears in the urine. It seems that the pancreas does not regulate the metabolism of levulose, for when there is intolerance for dextrose as in glycosuria, a good deal of fruit sugar can be assimilated. Probably the liver synthetizes the fruit sugar and in the severe hepatic lesion or in the presence of toxins in the blood which causes irritation to the muscles, which possess a considerable power to utilize sugars, levulose is abnormally excreted with the urine, though its permeability through the kidney is nearly four times less than that of maltose); the urine flows like that of a mad elephant in '*hasti meha*' (*polyuria* or the diabetes insipidus in which 10 to 20 quarts of pale urine is discharged daily). *Susruta* II. C. 10<sup>116</sup>.

116. तद्र वैतमवैदग्नेयुदकसहशसुदकमेही मेहति ; इचुरखतुल्यमिदुमेही, सुरामेही सुरातुल्यं, बहजः चिकतातुविलं चिकतामेही, अनैः सकफं व्यत्कं शब्दन्ते ही, विषटं लावण्यतुल्यं लावण्यमेही, हृष्टोमा पिण्डसतुल्यं पिण्डमेही, आविलं सान्द्रमेही, इक्कतुल्यं यज्ञमेही, लोकं लोकं सफेनं केनमेही मेहति ॥१०

"Any one who repeatedly urinates ink-colored (blackish) warm urine, suffers from 'kāla-meha' (*alkaptonuria*) in which the urine darkens on standing, due to the presence of alkaptone (glycosuric acid) or related oxyacids, or melanin from melanotic cancer; or in hemoglobinuria as in pernicious remittent bilious fever, due to the destruction of large amounts of erythrocytes, the blood-pigment may undergo change and appear in the urine as brownish-black or blackish, and for this reason the fever is called 'black-water-fever')." Charaka II. 4. 17.<sup>117</sup>.

*Prognosis:* "If one has acquired diabetes mellitus (*madhu-meha*) by hereditary transmission, he is incurable. It is not only hereditary glycosuria that is incurable, but all hereditary

अत ऊईं पितनिमित्तान् वशामः । सफेनमच्च नीलं गौलमेही मेहति ;  
सदाहं हरिद्राभं हरिद्रामेही, अच्छरसगव्यमस्तुमेही, चक्रतचारप्रतिमं चारमेही, मञ्जिष्ठी-  
दक्षप्रकाशं मञ्जिष्ठामेही, शोणितप्रकाशं शोणितमेही मेहति ॥११

अत ऊईं वातनिमित्तान् वशामः । सपि॑ःप्रकाशं सर्पिञ्चेही मेहति ; वसा-  
प्रकाशं वसामेही, चीद्रसवर्णं चीद्रमेही, मत्तमातहावदशुभृतं हस्तिमेही मेहति ॥१२

सुश्रुतस्त्रहिता, निदानस्थानम्, ६ ।

117. मसीवर्णं मज्जं यो मूवमुच्चं प्रमेहति ।

पितस्स परिकोपेण तं विद्यात् कालमेहिनम् ॥

चरकस्त्रहिता, मूलिदानस्थान, ४ ।

predispositions are hard to remedy." *Charaka VI. 6. 41<sup>119</sup>.*

"As birds easily take shelter in low trees, so glycosuria rapidly attacks those who are addicted to gluttony, but averse to bathing and walking (physical exercise and exertion). Glycosuria proves fatal for one who lacks energy, is very fleshy, fat and extremely corpulent. He who eats only to cover his metabolic needs, recovers his health." *Charaka II. 4. 32.<sup>119</sup>*

"If the diabetes lasts for a long time, then there are complications of polydipsia, fever, diarrhoea, hyperaemia, weakness, anorexia, indigestion and putrefying boils, abscesses and gangrenes." *Charaka II. 4. 30<sup>120</sup>.*

**118. जातप्रमेहो मधुमेहिनो वा**

**ग साध्य उक्तः स हि वीजदीपात् ।**

**ये चापि कैचित् कुलाजा विकारा**

**भवति तांच प्रबद्धसाध्यान् ॥ चरकस'हिता, विकितसास्यानम् ५, ४१ ।**

**119. गट्ठमध्यवहायै तु खानं च ज्ञानयहिष्म ।**

**प्रमेहः क्षिप्रमध्येति नीचद्वामनिवाष्टः ॥**

**मन्दोत्साइमतिश्लुभतिक्षिरधं महाश्वनम् ।**

**क्षयुः प्रमेहहपेण क्षिप्रमादाय गच्छति ॥**

**यस्वाहारं शरीरस धातुसाम्यकरं नरः ।**

**सेवते विविधाचाचारेष्टाः स सुखमन्तुते ॥**

**चरकस'हिता, गिदानस्यानम्, ४ ।**

**120. उपद्रवात् खलु प्रमेहिनां द्वाचाज्वरातिसारदाहीर्बल्यारोचकाविपाकाः ।**  
**पृतिमासचिपिक्कालजीविद्रध्यादयस तस्मप्रसाहाद् भवति ।**

**चरकस'हिता, गिदानस्यानम्, ४ ।**

"If a diabetic has boils then an expert surgeon shall treat him by cleaning and restoring (*cicatrizing*) them by his instruments. *Charaka VI. 6. 42<sup>121</sup>*.

**Prophylaxis:** In diabetes mellitus, it is necessary to know whether the disease is acquired or inherited. In lesions affecting the pons medulla, cerebellum, liver, thyroid and especially the pancreas, diabetes may be provoked. But in other diseases which do not seriously damage the pancreas, as in syphilis, acute infection, traumatic and surgical neurasthenia, physical and mental excesses, there usually exists a predisposing cause. The predisposing cause consists of metabolic deficiency of assimilating carbohydrates. It might lie in some inherent weakness of the hepatic and principally the pancreatic cells or that of the organism to burn the carbohydrates or that of the nervous mechanism controlling the process. Suśruta did not fail to distinguish them. He says :

121.

प्रभेहिणां थाः पिङ्कवा नयोक्ताः

दोग्गाधिकारे वृथगीव चतुः ।

ताः श्वस्यविद्धिः क्वश्लैषिकित्साः

शल्जे ष श्वोधनरोपण्ये च ॥

चरकर्दिता, चिकित्सालक्षण्, ६, ४२ ।

"Diabetes is either inherited or acquired (alimentary). Inherited diabetes is due to improper dietary. The hereditary diabetic is very lean, dry (skin), has weak appetite (*anorexia*), polydipsia and is very nervous ; the alimentary diabetic is fleshy, has voracious appetite (*bulimia*), adiposis and is addicted to sedentary habits (fond of bed, seat and sleep. The lean diabetic should be treated by dietetic regulation, and the fat diabetic by '*apatarpana*' (exercise and fasting).

*Suśruta IV. 11. 2<sup>122</sup>*.

Prophylaxis should begin with children, especially when children of hereditarily predisposed parents are found with tendencies to neurosis, gout or obesity, and they should not intermarry with families of the same diathesis, nor over-indulge in sugars or excess of carbohydrates. Adults with hereditary tendencies should avoid taking sugar and should not exceed in the carbohydrate diet beyond the physiologic

122. वी प्रमेही सहजोऽपथ्यनिमित्त भवतः । तद सहजी मादपिटौषी-  
दोषकृतः । चहिताहारजीऽपथ्यनिमित्तः । तदोः पूर्वे लोषद्वतः हाथो रुचोऽस्याशी  
यिपासुभूयं परिचरणशीलस भवति । उत्तरेष खूली बडाशी छिरघः श्यासनव्याप्तिशीषः  
प्रादेशिति । तद लाग्नमद्वपानप्रतिसंख्यात्मिः लियाभिषिक्तसित्, स्त्रूलमत्वं च-  
युक्तामिः ॥१

and metabolic needs. Rather it would be wise to partly replace the carbohydrates with fat and protein. Tendency to obesity should be combatted by regular exercise and frugal diet. When obesity has developed, it should be reduced by a slow process of moderate daily outdoor exercise and a slight undernutrition, especially in carbohydrates and fat.

*Treatment :* Glycosuria can be successfully fought only by rational dietary. It is a safe policy in the beginning of the treatment to eliminate all carbohydrates from the diet. It may be said against this, that the excretion of sugar in the urine is but a symptom of the lesion, and the elimination of the sugar can not remedy the cause of the lesion, and moreover even in a sugar-free diet, sugar is synthetically prepared and excreted out of the protein and fat molecules. This may be all true, but the clinical experience shows that in a sugar-free diet, the patient soon develops carbohydrate tolerance. And the presence of an excessive quantity of sugar in the circulation and tissues which can not be metabolized, causes various pathological changes and manifestations. Von Noorden finds the use of oatmeal gruel once a week proves very beneficial. But on the oatmeal day he forbids the

use of any protein, even not egg or milk. Only a little butter is permitted. And the day before the oatmeal diet, he gives only vegetables and fat. Levine finds that potato is just as efficacious as the oatmeal. Fruits containing minimum of glucose like the lemon and orange can be given, as there is certain tolerance for levulose. The alternating constipation and diarrhoea which is symptomatic of diabetes due to gastro-intestinal disorders, should be remedied by laxative and constipative food according to the needs. Strong purgatives should be avoided. If this is not sufficient, in constipation Carlsbad or Epsom salts can be given and in diarrhoea irrigation should be applied. Special attention should be given to the cleanliness of the skin as many skin lesions are apt to take place in glycosuria. Mild antiseptic neutral soaps, containing tar, boric acid or eucalyptus have proved beneficial. When an infective process has already begun, great care should be taken that the surrounding tissues or other parts do not become infected and for local use, iodoform, iodol or aristol can be used with advantage.

*Diabetes insipidus* : The pathology of this disease is not yet well understood. It occurs in cases where there is lesion in the pons,

medulla or the cerebellum. It may be caused by many diseases, but syphilis is the principal cause. And in that case its principal remedy is antisyphilitic treatment.

#### *IV.—Diseases of the Bladder.*

"There are twelve kinds of lesions of the bladder as follows :—annular swelling (*vātr-kundalikā*=*pericystis*), hard globular tumor (*mūtrasthīlā*=*myoma*), swelling of the mouth of the bladder (*vātavasti*=*prostatic hypertrophy*), difficult and scanty repeated urination (*mūtrātīta*=*vesical tenesmus*), abdominal bladder (*mūtra-jāṭhara*=over-distension and *hypertrophy of the bladder* with contraction and obstruction of the cavity), obstruction to the passage of urine (*mūtrotsāṅga*=*urethritis*), *uremia* (*mūtra-kṣaya*), *fibroma* (*mūtra-granthī*), *spermatorrhea* (*mūtra-sukra*), *cystitis* (*uṣṇa-vāṭa*) and gangrenous or suppurative *cystitis* (*mūtraukasāda*).

"If the urine is concentrated and is not evacuated (in time), the humor '*vāyu*' becomes vitiated and it circulates at the mouth in circular form (that is causes annular inflammation). This causes much pain and there is repeated painful scanty micturition. This difficult disease

is known as '*rāta-kundalikā* (*pericystitis*, which implies inflammation of the tunica advenitia of the bladder. Inflammation of the bladder (*cystitis*) may be provoked by various causes as follows : (a) Cystitis may occur during the course of many acute infectious diseases as acute articular rheumatism, typhoid fever, small-pox, measles, influenza, cholera, diphtheria. This complication may set in during the height of the disease, or may appear during convalescence. Toward its cause, a number of factors probably contribute. The chemical constituents of the urine are often profoundly altered : the urine is concentrated ; it contains abnormal substances of disturbed metabolism which are more or less irritant and moreover may contain the pathogenic germs of specific infections. The tissues of the bladder are deprived of proper nutrition and lack their full power of resistance. (b) In constitutional diseases as gout and diabetes in which the urine is irritant. (c) In general septicemia as pyemia or internal suppuration of any organ in which the suppuration foci may be brought to the bladder. (d) From irritating food and drink as excessive consumption of strong and irritant pepper and alcoholic drinks. (e) Infections from the adjacent organs as the kidney and the

urethra. The bladder may be affected by the kidney either directly by the urine, or by the lymph channel or by contiguity of the tissues. Urethritis is a common cause of which gonorrhea is an important factor. In acute gonorrhea the passage of gonococci is favored through spincter vesicae in its ascent during vesical congestion under sexual excitement or under the stimulation of alcohol or irritating spicy food. Chronic prostatic hypertrophy is also often a causative factor of the congestion of the base of the bladder. The cystites are of two kinds—simple aseptic and septic. The simple aseptic inflammation may be provoked by the irritating substances in the urine, metabolic or ingested, by the disturbances in the function of micturition or by the disturbances in the circulation incident to vascular or nervous conditions. It is well known that ammonia, oxalates, urates and sugar, if they are concentrated in the urine are active irritants of the bladder. And the primary role of the irritants can be ascribed to the uric acid sands and calculi. They by their mechanical irritation cause congestion and inflammation and if the pathogenic germs are present, ulcerous gangrenes. Disturbances in the functions of the urine

cause more or less hyperemia and inflammation. Over-distension of the bladder either voluntary or pathological, the too frequent and too forceful contractions in the act of urination bring about this condition. When the causes of the over-distension, retention and obstruction are organic, septic infection takes place. Various micro-organisms have been found to be related with the suppurative process as the staphylococcus pyogenes aureus, albus and citreus which can decompose urea, streptococcus pyogenes, bacterium coli, proteus vulgaris (which possesses the power of decomposing urea with the production of ammoniacal reaction), gonococcus and tubercle bacillus.

"Unusual frequency of micturition is present in all cases, except in the beginning and in mild cases when the urine remains acid. The causes of frequency are threefold, The reflex influences of an inflammation of the vesical mucous membrane are alone able to provoke frequent urination. In an analogous manner, the irritation of ammoniacal urine and of precipitated salts effects contraction of the organ. In cases of obstruction, the partial retention of the irritant urine powerfully excites the detrusors. Thus the condition of the frequent micturition is usually worse in the

contracted bladder of prostatic obstruction. In calculous cystitis, violent movement usually aggravates the condition. Tenesmus is frequently present. In some cases it becomes so exaggerated and remains almost constant, that the patient in order to get relief from the exasperating pain, constantly attempts to urinate, to force a few drops, though the bladder may be almost empty).

“*Vāyu*’ causes in the intermediate region of the lower intestine and the bladder, a hard, immovable and tough tumor. This causes the obstruction of the passage of the feces, urine and intestinal gas. This provokes tympanitis and pain. This (disease) is known as ‘*vātāṣṭhīlā*’ (*myoma* is usually a hard interstitial tumor, producing a globular induration of the bladder wall. It is generally located at the orifice of the bladder, and it has been noted from the size of a cherry up to such dimension as fill half of the cavity. The tumor is divided into lobules by connective tissue ; its main bulk is composed of unstriped muscle-cells, in some places arranged in fasciculi, in others irregularly grouped).

“In any one who retains urine, the ‘*vāyu*’ of the bladder becomes vitiated and closes the mouth of

the bladder, and consequently the urine is obstructed. And this vitiated 'vāyu' remains in the bladder and the prostrate (*kukṣi*—groin) as an oppressor (in intumescence). This disease is very hard to cure and it is called '*vāta-vasti*' (*obstructive hypertrophy of the prostate* which may range in size from an orange to that of a cocoanut. The hypertrophy may be general, affecting the whole organ symmetrically or the enlargement is confined within the capsule of the gland and may extend a considerable distance, pushing the capsule and remain only connected with the prostate by a glandular and fibrous tissue. As the internal sphincter may be considered as an integral part of the prostate, hence any alteration of the structure of the latter would be followed by the interference of the function of the former. In addition, as the prostate is limited in front and below by dense fascia, it tends to grow upward and backward as it hypertrophies, elongating and narrowing or deflecting the urethra, according to whether the enlargement is symmetrical or irregular, but always raising the vesical outlet to a higher level than normal. The urine therefore left after each micturition (residual urine) settles at the bottom, causing the formation of calculi by precipitation.

and sedimentation of the mineral constituents. And an early effect of the prostatic hypertrophy is congestion and later inflammation of that portion of the mucous membrane of the bladder in contact with the tumor. The inflammation spreads in time, aggravated by the sluggish venous return. And as the passage of the urine is reduced, the bladder can only be incompletely evacuated and a small quantity at a time by slow dribbling from the distended bladder. And in this condition, the mucous membrane offers but slight resistance to microbic invasion).

"If for a long time the urine is retained, then when an attempt is made for its evacuation, there is no micturition, or it appears but slightly. If strained, the urine appears with slight pain and in small quantities. This disease is caused by the suppression of the urine, and is called '*mūtrā-tīta*' (*vesical tenesmus*).

"If the urine is suppressed, it causes distension ; distension vitiates '*vāyu*' and provokes painful tympanites. This is called '*mūtra-jathara*' and this disease contracts the downward channel (*hypertrophy of the bladder* with contraction of the cavity and obstruction of the passage).

"In the disease in which the flow of the urine is interfered with either at the neck of the urethra

or near the glans penis, or under tenesmus bloody urine appears with pain, or without pain it dribbles little by little, this is known as '*mūtrot-saṅga*' (*urethritis*). This disease is caused by a qualified (special) '*vāyu*'.

"In an emaciated and tired body, '*pitta*' and '*vāyu*' absorb the urine. It causes hyperemia and pain. This disease is called '*mūtrakṣaya*' (*uremia*). This is very troublesome. (Uremia occurs in the course of acute or chronic nephritis, puerperal eclampsia, some cases of obstructed renal calculus, and occasionally in patients with pronounced vascular changes. The symptoms are general malaise, nausea, vomiting, insomnia, amaurosis, mania, delirium, dyspnea, increased arterial tension. In complete uremia, the patient lives about 10 to 12 days).

"The tiny, globular and firm tumor that is formed at the interior part of the neck of the bladder, is called '*mūtra-granthis*' (*fibroma* generally occurs in the adult and is usually located single upon the base and trigonum. The size is like that of a nut. It may be sessile or pedunculated, hard or soft. The surface is lobulated and covered with normal or inflamed mucous membrane, which may or not be firmly attached to the growth. On section the tumor is white

and glistening, and there may be patches of myxomatous or areas of calcification). This tumor is painful, nonulcerative and narrows the mouth of the bladder. It resembles pain like that of calculus.

"If any one indulges in sexual intercourse with full bladder, then the semen is displaced and becomes mixed with urine, and pale watery semen appears just before urination or after it. It is called '*mūtra-sukra*' (*prostatorrhea*).

"*Pitta*" becomes vitiated in heavy exercise, long journey or exposure to the sun, and mixed with the '*vāyu*' brings about the inflammation of the bladder, urethra and the pelvic region (sympathetic) and causes discharge. In this yellowish, slightly reddish (pinkish) or pure reddish urine is excreted with tenesmus. This disease is called by the specialists as '*uṇa-vāta*' (in non-suppurative *cystitis*, the urine is pale yellow, or according to the extent of bleeding, the color will vary from the faintest pink to a deep dark-red).

"The disease in which the urine is excreted with burning sensation, is turbid, dark-brownish and concentrated, and if dried (by the sun or evaporated), leaves a residue like powdered granite, is called the bilious '*mūtraukasāda*'.

(*suppurative cystitis*, in which the urine is turbid, containing tenacious flocculi of altered pus and there is a large amount of precipitated salts and detritus. On standing, a heavy sediment forms, but the supernatant urine does not become clear. The crystalline sediment consists of a moderate amount of amorphous phosphates, amorphous ammonium urates and large quantities of triple phosphates. The crystals of ammonium urate are dark balls which may be spiculated ; the triple phosphate commonly appears in the form of slab-shaped crystals ; there may however, be needles, squares and many forms of irregular crystallization). The disease in which the urine is whitish, concentrated and appears with tenesmus, and when dried, it is pale-colored like the conch-shell powder and is slimy, is to be known as phlegmatic '*mūtrau-kasāda*' (*cystitis* and tumor of the bladder in which the urine is pale-whitish, opalescent, with a heavy deposit of pus, phosphates and detritus. It is alkaline in reaction. The benign tumors are in themselves quite compatible with long life: in several carefully observed subjects, they existed, ten, twenty or more years. The course of papilloma is largely determined by the hemorrhage and the complications. The malignant

tumors are usually fatal within one or two years, particularly of the base or the neck. The fatality of the disease of course depends upon the site affected, the variety of growth present, the clinical course, and complications of cystitis and nephritis. The causes of death are indirect. Rarely profuse hemorrhage has been the direct cause. In the cachectic debility which follows prolonged hemorrhage, the system becomes vulnerable, and any intercurrent disease may prove fatal). "Charaka VI. 58, 2-13<sup>123</sup>.

123. बातकुचिकित्सांशीका बातवस्तिकार्यम् ।  
 मूलातीतः सवठरो मूलोत्सङ्गः चवस्ता ॥  
 मूलीकसादी री चापि रोग चादश कीर्तितः ॥ १  
 रीच्छाहे नविधाताशा चायुर्वेदी चवेदनम् ।  
 मूलं संग्रहं चरति विग्रहः कुच्छलोहतः ॥  
 स्त्रीदत्यात्मनवदा सद्ग्रहः श्लेष श्लेषः ।.  
 बातकुचिकित्सां तानु व्याख्यिं विद्यात् सुदावचम् ॥ २  
 श्लेषार्गस वसेच चामुरज्ञरमात्रितः ।  
 अडीक्षावद्वनं यच्चि॑ करोत्यवस्तुतमम् ॥  
 विक्ष्यानिलकुच्छस्य तदाभागच्च आयते ।  
 वेदना आवते वसी बातांशीकिति ता विदुः ॥ ३  
 वेगं विधारयेद्यद्यु मूलसाकुच्छो नरः ।  
 निरुचिति सुक्षं तस्म वसेवैक्षिगतीऽनित्यः ।  
 मूलकृष्णी भवेत् तेज वक्षिकुचितिपौहितः ।  
 बातवस्तिः स विज्ञे वी व्याख्यिः इच्छादानः ॥ ५

"In these thirteen kinds of urinary troubles use remedial medicines which will relieve strangury. In all these lesions bougie and irrigations are applicable.

The cylinder of the bougie is to be made of

देणे सन्धार्य नूबस वो भूयः बहुमिष्ठति ।  
 तस्म नाभेति यदि वा कषवित् संप्रवर्तते ॥  
 प्रवाहती मन्ददग्धमस्यमस्य युनः युनः ।  
 मूलाशीदग्धु ते विद्याभूबदेगविचातग्धु ॥ ६  
 मूलस विहृते देणे तदुदावर्णहितुना ।  
 अपानः कुपितो वायुवदर्प पूरवेदभूषण ।  
 नामिरवधासाधानं जगवित् तीव्रवेदनग्धु ।  
 तं मूलकठरं विद्यादधः खोतोग्निरोषकग्धु ॥ ७  
 यस्ती वायवया नासि नस्ती वा वस्त्र देहितः ।  
 नूत्रं प्रहृतं सर्वे त उरक्तं वा प्रवाहतः ।  
 सवेष्टनेरज्ञमस्य उद्धं वाय नीहजग्धु ।  
 विगुचानिक्षणो व्याखिर्न् द्वीपस्त्रः स संग्रहः ॥ ८  
 वस्त्र लानदेहस वक्षिल्लो विचापादती ।  
 उद्धाइवेदनं छाप्तं कुप्यातां मूत्रसंचयम् ॥ ९  
 अभ्यन्तरे वक्षिमुखे हसोऽसः फ्लिर एव च ।  
 वेदनावाननिष्ठदी मूत्राग्नंग्निरोधमः ।  
 नावते उद्धासा यस्त्र दग्धिरश्मरिष्यवचः ।  
 स मूत्रयन्धिरित्येवमुच्चते वेदनादितिः ॥ १०  
 प्रथुपक्षितद्वात्रुक्तु ने युनं बोडमिष्ठति ।  
 तस्म मूत्रयुतं रेतः उद्धासा संप्रवर्तते ॥

gold or silver. The aperture of the cylinder made of gold should be like that of the jasmine flower stem, and that of the silver like a mustard seed. It should have the shape like a cow's tail (slightly curved and graduated in dimension), with two rings (so that it can not be pushed farther than is necessary, or it might wound the bladder) and twelve digits long." *Charaka VIII.* 9. 28-29<sup>124</sup>.

मुरसादापि सूतुलं पशादापि बदाचन ।  
 भजोदक्षिणीकार्यं सूतुहलं तदुच्छते ॥ ११  
 आवानाभातपैः पित्तं वसितं प्राप्यानिकामृतम् ।  
 वसितमिङ्गुदर्थं च मदहल् आपयेदधः ॥  
 सूतुं हारिद्रमवाचा सरक्तं रक्तमेव वा ।  
 लक्षात् प्रवर्तते जनोदच्छातं बदलि तम् ॥ १२  
 विश्वं योदक्षं सूत् सुकारं वहत्वं तदा ।  
 एष्वं भवति वशापि योदकाच्च चंद्रश्चिभल् ।  
 सूनीकवादं तं विद्याद्वीनं पिण्डातं तुष्टः ॥  
 चक्रं भवति यशापि चंक्षुच्च प्रपाञ्चुरम् ।  
 पिण्डिवं संहतं चेत्तं तदा लक्षं व्रवर्तते ।  
 नूनीकवादं तं विद्यादानवशापरं कफात् ॥ १३  
 सुकुतस्त्रिता, उत्तरतमन्, ५८ ।

124. हीवाधिक्षमवेष्वं तान् सूतुहल्लूहर्जयेत् ।  
 वसित्तुत्तरवसित्त चक्रं वामिव योजयेत् ॥  
 मुष्पित्रवन् ईमं स्नात् त्तुत्तीत्तरवसित्तम् ।  
 आतीपूष्पक्ष इवेन सन् गोपुच्छसंस्तित्तम् ॥  
 रीव्यं चा सर्वपिण्डिद्वं दिक्षर्वं शाहान्तु चन् ॥  
 अरक्तस्त्रिता, विहित्तानम्, ६१ ।

The underlying principles in the treatment of acute or chronic cystitis are (a) to render the urine bland and slightly antiseptic; (b) to put the bladder at rest and to relieve pain; (c) to lessen pelvic congestion. With healthy kidney and in non-suppurating cystitis of the bladder, the urine may be made bland by drinking a good deal of whey or butter-milk or plenty of pure water. Hot baths, particularly hot sitz-baths are revulsive and counter-irritant. They relieve pain and congestion. To relieve congestion leeches may also be applied to the peritoneum and above the pubis. To make the urine slightly antiseptic, salol can be administered three times a day, in small doses of five grains.

But in chronic cystitis, irrigation is the best curative means known. Irrigation removes mechanically decomposing discharges, diminishes the quantity of pus and mucus, renders the urine bland and unirritating, lessens the severity of the inflammation, lessens further fermentation and decomposition, and exerts a stimulating and healing influence upon the diseased membrane. The main symptoms of cystitis, frequency, urgency, tenesmus and strangury are chiefly dependent upon inflammation located

about the vesical neck. Though irrigation can not disinfect the entire diseased and suppurating tissues, this part can be easily reached, and the healing influence of a disinfectant and soothing lotion can be easily exerted on it. This can be accomplished by irrigations, instillations or drainage, or all these combined. For irrigation, a weak, non-irritating, antiseptic solution is preferable as silver nitrate 1: 5000 to 500, potassium permanganate 1 : 5000 to 2000, carbolic acid 1 : 500, boric acid 1 : 50, normal saline solution 0.7 per cent. Irrigation is only recommended when the patient urinates easily and empties his bladder completely. But bladder should not be distended to the point of causing pain and spasm. Usually one daily irrigation is sufficient, but in severe cases, it can be repeated. When urination is extremely painful, irrigation can be done by a soft catheter. The catheter is attached to a fountain syringe. The lotion is allowed to flow through, and while it is flowing, the catheter is slowly passed into the bladder. Three to five ounces are injected and the tube leading to the fountain syringe is discontinued, and the injection is allowed to flow out.

Instillations are applied by means of an

instillator, which is a silver or hard rubber cylindrical catheter about 18 Fr. caliber, provided with a fine canal. To the end of the shaft of the catheter is fitted a hypodermic syringe with a capacity for forty minims and is filled with a choice lotion, silver nitrate 1 to 5 per cent in gonorrhreal cystitis, iodoform emulsion in tubercular cases with ten per cent glycerine. The catheter is lubricated with glycerin or boroglyceride, and is introduced into the urethra until its tip is within the grasp of the compressor urethrae muscle. The piston of the syringe is then driven down, causing the injection to flow along the membranous and prostatic urethra into the bladder.

The simplest and the safest form of drainage is that by continuous catheterization. A soft catheter of medium caliber should be selected. Important points to observe are that the eye of the catheter lies just within the bladder and that the instrument thoroughly and continually drains this viscus. To determine the eye of the catheter in relation to the neck of the bladder, the instrument is introduced and the bladder is emptied. Four to six ounces of boric acid solution are then injected, and the catheter is withdrawn until the fluid ceases to flow. It

is then passed in until the fluid begins to flow, and is held in this position until the bladder is empty. This continuous catheterization may be kept up from one to three weeks. It usually causes a mild traumatic urethritis. This is treated by withdrawing the catheter slightly at each irrigation until its end lies without the compressor urathræ muscle. By forcing an anti-septic solution into the catheter, it will then flush out the entire anterior urethra. In case of intense pain, suprapubic drainage can be also performed with advantage.

The method adopted by the Charaka School is as follows :—

"The patient after his bath, shall take meat broth or milk. And he shall be seated on a soft, easy and comfortable cushion, after he has evacuated his bladder when there is natural call. Then his penis should be massaged with ointment. After that a sound (*śalākā*) should be introduced for the urethral exploration. If the sound passes without any obstruction, then it should be withdrawn, and the eye of the bougie introduced. All the regulations recommended for anal irrigation (*enema*) are to be observed. If the lotion is allowed to flow at great speed, it causes inflammation of the base,

and if it be not sufficient, it does not spread all over the surface, so with a steady hand (not trembling), the bougie is to be introduced and withdrawn." *Charaka VII. 9.3*<sup>111</sup>.

*Prodrome of lithiasis* : "Bladder-irritability, anorexia, strangury, lacerating pain at the neck of the bladder, scrotum and the urethra, fever, lassitude, and the goat-smell of the urine are the prodromes of lithiasis. Moreover, before the calculus formation, the color of the urine becomes unnatural and micturition is painful. The urine is concentrated and cloudy (with urates). The urine becomes corrupt with 'vāyu' (ammoniacal decomposition).

*Symptoms* :—With the calculi formation, there are pains in the umbliculus, bladder, scrotum,

125.

आतम्य मुक्तमहाम् रसेन पथसापि च ।

सूष्टिविष्ट सूष्टिविष्ट योठे जागुसनि वदी ॥

ज्ञानोः सुखोपविष्ट इटे भिटे हताचिते ।

श्लाकशान्विष गतिं यद्यप्रतिहता ब्रजेत् ॥

ततः श्रेष्ठः प्रमाणेन पुष्पनेत्रं प्रवैष्येत् ।

गुह्यवच्छूलार्थं प्रवैष्येदगुह्यं सिवणीम् ॥

हिंसाहतिगतं वक्तिस्तुते खेडो च गच्छति ।

सुखं प्रोत्य गिर्वाय<sup>१</sup> निष्कर्षेऽप्येवं च ॥

चरकरुहिता, विशिष्टान्म ॥

urethra and their adjacent regions at the time of micturition, sudden interference with the flow of the urinal stream (by the spasmodic closing of the voluntary muscles when a small stone is forced into the vesical orifice), bloody urine (the blood is invariably present in the vesical calculus, though the hemorrhage from the bladder is never profuse ; the quantity of blood and the degree of pain depends on the nature of ulcerated surface and the contour of the stone ), splashing urine, the color of the urine like that of a gem (reddish), clear urine containing sand ( uric acid crystals) and pain is much increased by running, jumping, riding and long journeys (violent movements are apt to cause friction of the stone with the vesical surface )." *Susruta* II. 3. 4-6<sup>120</sup>

126. तासा पूर्वेषपाणि बक्षिपोङ्गारोचकी भूवलक्ष्म वक्षिश्चिरोमुष्कवेक्षणा वेदना  
ज्ञाना अवरायतादी वस्त्रगम्भिल मूलसेति ॥ ४

वदासं वेदनावर्द्धं इट् रान्द्रमधाविद्वम् ।

पुर्वेषपेऽप्यानः ज्ञानाप्युर्द्धं रुक्षति मानवः ॥ ५

पव आतापु नामिविदिसिद्धनीमिहनेष्ववतमन्तिन् भैहो वेदना भूवधायादहः  
वस्त्रविद्यूता भूत्प्रिद्विरचन्त गोमेदकप्रकाशमन्ताविद्व चुविकतं विद्युतिं भावनशङ्ख-  
ड्वनशङ्खवाणाभवत्त्वात्त वेदना भवति ॥ ६

दमुत्तव्विता, निदानसामन्, ३ ।

"As gallstone is formed in a cow by desiccation of the bile, so calculus is formed. *Calculi* are formed in various shapes like that of the flower of '*nuclea cadamba*' (the oxalate-of-lime calculus is the hardest, often orange-dark in color, more or less spherical in form and studded with nodules, whence it derives its name as mulberry calculus); like stone (finely laminated stones are often found among the vesical calculi, with alternate layers of distinctly crystalline oxalates and urates; the urates are yellow-reddish in color); smooth (pure uric-acid stones are the softest, are yellow, red or brown in color and generally present a smooth surface); like pea (*custin*) or soft (amorphous phosphates). If the calculus is pushed against the vesical orifice, then the passage of urine is obstructed, and it provokes great pain (the stone is grasped and forced against the sensitive neck either by the flow of urine or in violent motion as jolting over a rough road or riding). This exasperates the patient and he makes repeated attempts to urination. There is defecation with tremor. There is lancinating pain in the scrotum, urethra and the bladder, and if the urethra is wounded, the urine comes mixed with blood. But when the calculus is dislodged from the

vesical neck, the urine again flows with ease. If the calculus is split into fragments, it passes through the urethra and is called 'sarkarā' (gravel)." *Charaka VI. 26. 21<sup>27</sup>*.

"*Gravel (sarkarā), sand (sikatā—uric acid brick dust, a fine yellow reddish sediment) and amorphous phosphates (bhasmākhya-meha)* are varieties of lithiasis. The symptoms and pain of gravel resemble that of calculus. If the calculi (concretions) are tiny, they are excreted with the urine, with favorable 'vāyu'. If the calculus is split up into minute fragments by 'vāyu', it is called the gravel. The gravel causes heartache, fatigue of the thighs, pain in the perineum, tremor, polydipsia, nausea, cyanosis, anemia, weakness, anorexia and indigestion, if the gravel be obstructed in the passage through the urethra.

127. यदा तदाश्मर्युपजायते तु क्रमेन पित्तेष्व रोचना गोः ॥  
 कद्यपुष्पाक्तिरसतुल्या द्वच्छा विपुष्पयथवापि वही ।  
 मूदस्य च आर्ग्मुपैति रुद्धः मूद्वं रजां सस्य करोति वही ॥  
 वज्जाति भेदः स तु वेदभासर्त्ते म इः शक्तम् चति वेपते च ।  
 सर्वाद्यनोभेहनवक्षिग्लूं विश्वोण्धारच करोति मूदम् ॥  
 चोभात् चते मूदयतोह सास्त्रं तस्माः सुखं मूदयति व्यपायात् ।  
 एषाम्हरो मादत्तिन्द्रियः स्थाचकरा मूदपथात् चरन्ते ॥  
 चरकसु'हिता, चिकित्साशास्त्रम् ३६ :

"*The bladder* is situated in the midst of umbilicus, back-bone, pubic bones, scrotum, rectum, groin and the urethra. The bladder has only one orifice or outlet (urethra) and its base is downward, its skin (muscular coating) is thin. The bladder is like bottle-gourd (*alābu-lagenaria vulgaris ser*) in shape and is covered with nerves, arteries and veins. The bladder is situated in the pelvis, between the pubic bones in front and the rectum (in woman, the uterus) behind. During the fetal and infantile life, it is usually situated above the pubes. It is a flattened, more or less horizontal body, when empty, but when distended, it becomes an oval bag and rises so as to occupy more or less the hypogastrium. It is attached below, but free to expand above. It is essentially a muscular organ, lined with mucous membrane and covered except in its lower portion with a loosely attached peritoneal coat. Into its lower and posterior portion, the ureters empty, and from its neck the urethra arises. When not over-distended, it holds about a pint of urine—somewhat more in woman than in man. It is a hollow organ, serving as a receptacle for the urine and has a strong muscular investment of unstriped muscles in several layers, which are innervated by branches from the sacral nerves).

The bladder, the bladder-neck, (perhaps including the prostates) urethra, testicles and rectum are all united in one system (genito-urinary) and is situated within the pelvis. The other name of the bladder is the '*receptacle for the excretory product*' (*malādhāra*), and it is a vital organ. As rivers discharge their waters into the ocean, so the tubules in the digestive canal (*the kidneys* are bean-shaped organs, about  $4\frac{1}{2}$  inches in length and 2 inches in width and  $1\frac{1}{2}$  inches in thickness, lying on either side of the spinal column, behind the peritoneum, about opposite the twelfth thoracic and first three lumbar vertebrae. At the inner edge of each kidney is a concave depression, the '*hylus*', where the vessels and the nerves enter and leave the organs and where the ureter emerges. The kidney is enclosed in a fibrous envelope, the '*capsule*', which dips into the sinus at the hylus. The substance of the organ is divided into cortex and medulla. The former is darker colored and more granular in appearance than the latter ; it contains the Malpighian corpuscles and most of the convoluted tubules. The medulla is lighter in color and striated and contains the majority of the straight tubules ; it is formed of the pyramids whose bases rest in the cortex and

whose aspices are the renal papillæ at which point the central collecting tubule opens into a calyx, this in turn emptying into the pelvis of the kidney from which the water with the waste products of metabolism dissolved into it passes into the ureter and thence into the urinary bladder, discharges the urine into the bladder. These tubules are thousands in number and because of their minuteness, they are invisible. Awake or asleep they trickle down by osmosis (*nisyanda*) and fill up the bladder, as a new earthen pot (porous) is filled up by the surrounding water, if pressed down into it up to its neck." *Susruta* II. 3. 13-14<sup>120</sup>.

"Calculus is hard to cure and is dangerous.

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128. श्वरंरा सिकता मेहो भजात्योऽस्मरिवैकातम् ।  
 अग्रमयाः श्वरंरा च या तु लव्यव्यञ्जनवेदना ॥  
 पवनेऽगुणे सा तु निरित्यसा विशेषतः ।  
 सा भिन्नमूलिं वंतिन् श्वरंरेत्यभिक्षीयते ॥  
 हत्पीडा सक्षिप्तदनं कुचिशलं सवेष्य ।  
 दधोर्बंगोऽनिलः कार्बर्गं दीर्घल्यं पाण्डुगावता ॥  
 अटोचकाविपाको तु श्वरात्मं भवन्ति च ।  
 मूवमार्गप्रदशा सा सक्ता कुर्यादुपद्रवान् ॥  
 दीर्घल्यं सदनं कार्बर्गं कुचिशलमरोचकम् ।  
 पाण्डुलघुचक्रवातच दधां हत्पीडनं विनम् ॥ ११

When it is young (tender), it may be controllable by medicines, but when it is mature (hard), it has to be extracted by operation.

"In the preliminary stage of lithiasis oleaginous potions are beneficial and remove the cause of its formation. A decoction of Plectranthus scutellaroides, Aeschynomene grandiflora, Pothus officinalis, Oxalis, Asparagus racemosus, Flacourzia cataphracta, Solanum jacquini, Flacourzia sapida, Columba domestica, Solanum melongena, Barleria caerulea, Pentaptera arjuna,

नाभिषृष्टकटीसुख-गुदवड्क्षणशेफसाम् ।  
 एकहारसतुल्वको मध्ये वस्तिरथोमुखः ॥  
 अलाव्या इव रुपेण शिरासायुपरिग्रहः ।  
 वस्तिर्वस्तिरथं व पौरुषं द्विषयो गुदम् ॥  
 एकसन्धिनिं स्त्रीते गुदास्थिविवरस्थिताः ।  
 शूद्राशयो भजाधारः प्राणायतनसुचमम् ॥  
 पक्षाशयगतास्तव नाश्यो मूत्रवहात्तु याः ।  
 तर्पयन्ति सदा सूक्खं सरितः सागरं यथा ॥  
 सूक्खात्त्वाग्नीपलभ्यन्ते सुखान्यासां सहस्रशः ।  
 नाशीभिरुपनौतस्य मूत्रसामाशयान्तरात् ।  
 जायतः स्वपत्तये व स निष्ठन्दे न पूर्यते ॥  
 चा कुखात् सक्षिले न्वस्तः पार्चेभ्यः पूर्यते नवः ।  
 चटो यथा तषा विहि वस्तिर्वेण पूर्यते ॥ १४  
 सुशुतसंहिता, निदानसामनम् ।

*Andropon muricatus, Trapa bisponosa, Hedysarum gangeticum, Bballuca, Capparis trifoliata, Tectonae grandis fructus, Hordeum hexastichon, Dolichos biflorus, Zizyphus jujuba and Strychni potatorum fructus, seasoned with clarified butter, and sprinkled with alkaline earth, if drunk in proper doses, causes fracture of the calculi. And in addition, in this treatment alkalies, barley-water, soup, astringents and milk should be drunk for the amelioration of 'vāta'. Subrūta IV. 7. 3<sup>129</sup>.*

129. अस्तमरी दाढ़चो व्याधिरक्तप्रतिसो मतः ।  
 चौषधिसंबलः साध्यः प्रहृष्टे दमर्हति ॥ २  
 तस्म पूर्वे तु रुपेषु क्षेत्रादिक्रम इच्छते ॥  
 तेग्नास्त्रापचयं यानि व्याधिर्मूलान्यशेषतः ॥  
 पाषाणमेदो वसुको वशिराक्षमनको तथा ।  
 अस्तावरी च दंड्हा च उड्हती काष्ठकारिका ॥  
 क्षणोदवहारण्डः लक्ष्मीशीरकुमकः ।  
 हृषादली भद्रुकव वहणः शाकज्ञ फलम् ॥  
 यवाः कुलत्वाः कोक्षानि कालकास्त्र फलानि च ।  
 क्षवकादिप्रदोषापमिवां क्षायेष्वर्तं लक्ष्म ॥  
 भिनति वातसन्धूतामृतर्दो विप्रमिव तु ।  
 चारान् यवागूयं वांश क्षायाद्यि पर्याप्ति च ।  
 भोजनानि च कुम्भैत वर्गेऽग्निं वातमाशने ॥ ३  
 हनुगमं हिता, विवितिसुतासामन, ० ।

Spontaneous fracture of stone has been observed by many in the bladder (*Ord, Debout d'Estrees, Fenwick, Martin, etc*), either by radical cleavage from the centre to the periphery or by splitting in concentric laminae. It has been demonstrated that spheres of carbonate of lime, which had formed in solutions of gum, split radially and disintegrate, if placed in a solution of different specific gravity. It is possible that in a similar way, the urinary calculi split and disintegrate under the influence of varying specific gravities and reactions of the urine, which causes molecular tension and cleavage, and consequently spontaneous cure takes place at some famous springs (as Carlsbad or Contrexeville) which enjoy special reputation for this curative property. Uric acid or oxalate of lime calculi can be formed only in strongly acid urine while in the alkaline urine phosphates of ammonia and magnesia are precipitated. Therefore if in the uric acid or oxalate of lime calculus, the urine can be made and kept alkaline for some time, it is likely to create molecular instability of the calculi and split them into fragments, gravel or brick dust. And vice versa in phosphate calculi, Carbonate of potash, acetate of potash, piperine, common and lithia

salts are also reputed to exercise a solvent action upon uric acid crystals in the urine.

"If emulsion, alkalies ( carbonate of potash ), astringent infusion, milk and bougie do not relieve the calculi, then operation is the only remedy. *Susruta IV. 7. 11<sup>130</sup>*.

"Place the patient upon the lap af a strong man (to hold in position) seated on a knee-high table. The patient with courage and determination stretches his upper part on his back and his pelvis raised by a cushion underneath it ; the legs are to be flexed (to about a right angle with the table ) and supported by a man (on each side), or held in position by a cloth crutch. Then the umbilical region should be massaged and pressed with unguents by hands as long as the calculus does not come below the umbilicus. Next after manicuring and lubricating the fingers with oil, the fore and the middle-fingers of the left hand should be introduced in the rectum towards the raphe scroti. When the calculus has been found, it should be carefully forced down between the

130.

घृतैः चारैः कषायै च चौरैः सोत्तरवस्तिभिः ।

यदि नीपश्चन् गच्छे दस्तबोत्तरो विधिः ॥

समुत्तरंहिता, चिकित्सितस्थानम्, ७ ।

middle of pubis and the urethra, and placed in an even, medium-sized and polished staff, and pressed so hard that the calculus appears like a tumor....Incision should be made about third of an inch to the left of the raphe scroti ( and an inch and half from the anus ) of the size of the calculus. According to some (authorities ), if it facilitates the operation, incision can also be made at the right side. But care should be taken that the calculus be not broken ( into fragments ) by the instruments or pulverized, for if even a minute fragment remains ( in the bladder ), the calculus grows ( round it as nucleus ). Therefore for extracting calculi, use forceps with curved blades ( serrated and concave in the inner side ).

"In woman, the uterus is situated by the bladder, therefore do not make long incision, nor deep incision, as it might wound the sphincters (*mūtra-srāvī*). If the incision is made at the proper place ( by distending the bladder upward and forcing the calculus downward ), it might also result in the incontinence of urine in man by severing the sphincters ( by the lateral perineal incision ). Without lithotomy, there cannot be any break in the bladder, but if it does (in rupture by over-distension).

sion), the patient dies. If however in the extraction of the calculus, the bladder is penetrated, the patient might survive, for the medicines that are used for the healing of the incision wound, can be also applied for the cicatrization of the other wound. And the penetration of the bladder ( sphincters ? ) is not in violation of the ( medical ) code. Moreover, the urine causes the formation of the calculus, and the little incontinence of the urine can not do much harm, and though the barley-water is diuretic, it is found beneficial (in lithiasis). After the extraction of the calculus, the patient should be given hot sitz bath ( hip bath ), for in hot water, the bladder can not be filled with blood. But if it takes place, the bladder shall be irrigated with astringent effusion of Ficus glomeratae." *Susruta IV. 7. 13-15*<sup>131</sup>.

"Prostatolith or phosphatic crystals ( prosta-

131. ततो बलवस्त्रविद्वयमाजातुहमि फलके प्राणपदेशं पुरुषवा तस्मैत्  
महो निष्पत्त्यपूर्वकायसुसानमुक्ततकटीकं वस्त्रधारकोपविद्वं सहुचितजातुशृण्परमितरिष्व  
सहाववद्धं लब्धे च शाटकैर्वा ततः स्थनाभिप्रदेशस वामपात्रं विश्वद मुटिनाव-  
पौडियेदधीनभिर्यावदश्मर्यंधः प्रपञ्चेति । ततः च हाथते कुमनखे वामहस्तप्रदेशिनौ-  
मध्यमि पायी प्रणिकायातु सेवनीमासाद्य प्रथववलाभ्या पायुमिद्वान्तरमानीय निर्वाचीक-  
मनायतमविदमस्त वल्लं सज्जिवेष्य भूम्यम त्वौडियेद्वालिभ्या यथा यन्त्रिरिवेष्टं शस्तं  
भवति ।

tic calculi are of two kinds—those formed in the kidney or bladder and lodging in the prostatic sinus, and those which originate in the gland itself ), if they are dislodged from their own cavities and are locked up in the passage through the urethra, they should be extracted (by forceps) through the urethral passage. If it can not be done then an incision should be made in the urethra (*median perineal urethrotomy*) and the calculus extracted by hook-forcep. And though the wound is cicatrized for a year, sexual intercourse, riding horses and elephants, tree-

स चेद् गट्टीतश्ल्ये तु विडाशो विचेतनः ।

इतवज्ञवशीर्ष्य निर्विकारो वृत्तीपमः ॥

न तस्य निर्झरेक्ष्य निर्झरेत् तु विदेत सः ।

विना खेतेषु इषेषु निहर्सुं समुपाषरेत् ।

सब्ये पात्रे सेवनो यवमादेण मुक्तावचारयेत् ग्रस्मग्रस्मोप्रमाणः ; दक्षिणतो वा क्रियादीकर्थहेतोरिल्लेके । यथा च न भिद्यते चूर्जते वा तथा प्रयत्नेत्, चूर्जस्यवलयद्वितं हि पुनः परिहितमिति, तदात् समसामयवद्वा आददीत ॥ ११

स्त्रीषामु वक्षिपात्रगतो गर्भाश्यः सहिकृष्टः, तदान्नासाम त्सङ्घवक्ष्य वातयेत् अतोऽन्वया खलूषां सूबजादी व्रशी भवेत् । पुरुषस्य वा सूबप्रसिक्षणान्तुचररम् । अङ्गरीत्रयाहते भिन्नो वक्षिरेकधा न भवति, विधाभिन्नवक्षिराग्रस्मिको न सिद्धति ॥

अग्नरीत्रयनिमित्तमिकधाभिन्नवक्षिरीवति क्रियाभ्यासात् शास्त्रविहितव्ये दात्रिःसद्य-परिहितलाभ शस्त्रस्येति । उच्चृतश्ल्येण औदकद्रोषामयतार्थं स्वेदयेत्, तथा हि वक्षिरहजा न पूर्वते । पूर्णे वा चीरहचवचायां पुष्पनीवेच विद्यात् ॥

सुवृत्तस्त्रिता, विक्षितस्त्रानन्, ७ ।

climbing, mountaineering, charioteering and swimming should not be indulged in ; heavy indigestible food should also be avoided.

Make incision so that the prostate, vesicula seminalis, vas deferens, ureter, raphe scroti, vagina, rectum or the bladder are not hurt. If the prostates are severed, death takes place by the accumulation of urine in the bladder (the passage for the discharge of the urine into the urethra being blocked by the tumorous or hypertrophic growth of the prostate); by the severance of the vesicula seminalis, death or eunuchism takes place ; by the severance of vas deferens, impotence ; by the severance of the ureter, dispersion of the urine (to the contiguous tissues by percolation) ; wound in the raphe scroti causes intense pain ; and if the bladder and the rectum are wounded, all the symptoms due to their penetration, mentioned before, appear.  
*Susruta IV. 7. 19-20<sup>132</sup>.*

*Modern lithotomy* hardly differs much from that of the *Susruta* school, especially when lateral

132. मूर्तवहश्चकवहम् ज्ञासोतोमूर्तप्रसेकसेवनीयोनिगुदवसीन् परिहरित्। तत्  
 मूर्तवहश्चेदामरणं मूर्तपूरणं वसेः यक्रवहश्चेदामरणं क्षैष्यं वा। मुज्ञासोतपचाता-  
 खलभावः। मतुप्रसेकचण्णान्म त्रुप्रचरणम्। सेवनीयोनिश्चेदाद्वु अः प्रादुर्भावः।  
 चक्षिगुदविवाचचरणं प्रागुक्तमिति॥

incision is made, except that before operation, the bladder is drained off and distended by hot boracic lotion, and kept in that condition during operation by plugging the spigot of the silver catheter by which the injection has been introduced. But generally now-a-days supra-pubic operation is preferred, but below the peritoneum, as higher up serous membrane is met. After the bleeding has stopped, the wound is closed by sutures.

However, litholapaxy seems to be the favorite means adopted for the removal of vesical calculus. And when the urethra is not roomy enough to admit an instrument of adequate calibre, or the stone is very large or hard (oxalate of lime calculus), and if under these circumstances, litholapaxy can not be practised, lithotomy is adopted for the removal of the stone. Lithotrity consists of crushing the stone within the notched and fenestrated inside surface of very hard steel

#### मध्यत्रावद

मर्द्दांश्चाषावसम्बुद्धं खोतोजानि श्रीरिणाम् ।

व्यापादयेद्वद्वन् मर्द्दांश्चकर्मा पटुभिर्जक् ॥

सिवनी शक्तिहरणी खोतसौ फलयोग्यदम् ।

मृतसेकं मुतवह्वं मंत्रविलक्षणामः ॥

सुश्राव्यहिता, चिकित्सितखानम्, ८ ।

blades under a severe and continuous pressure into a very fine powder, and the removal of the detritus by flushing out through a full-sized hollow metal catheter and an India-rubber wash bottle.

### *V Diseases of the mouth.*

"There are sixty-five diseases of the mouth. The centers of their origin are seven, namely, lips, gum, tooth, tongue, palate, throat and the buccal cavity. Of these the lips have eight kinds of diseases, gum fifteen, teeth eight, tongue five, palate nine, throat seventeen, and the buccal cavity three". *Susruta* II. 16. 2-3<sup>33</sup>.

"In the 'vāta' affections, the lips are asperous (herpes upon the lips are common in malaria, fevers, pneumonia, acute coryza as well as other febrile diseases; cracks or fissures—*rhagades*—or the scars resulting from them, if occurring in infants or children, are indicative

133. म खरोगः पञ्चवटिः सप्तस्थायतनेषु । तत्रायतनान्यठौं दन्तम लानि दन्ता ।  
जिङ्गा तानु कर्षः सर्वाचि चेति ॥  
तत्राणांशोषयोः पञ्चदश दन्तम लेषु । अष्टौ दन्ते तु । पञ्च जिङ्गायाम् । नव  
वासुनि । सप्तदश कर्षे । वयः सर्वे आयतनेषु ॥  
सुशुतसंहिता, निदानस्थानम्, १६ ।

of congenital syphilis ; the vertical crack in the middle of the lower lip, as occasionally seen, may be due to defective nutrition or may be associated with stomatitis ), dry ( associated with herpes or gastro-intestinal disorders, numb ( labial paralysis or bulbar palsy ), blackish ( cyanosis associated with open and dry lips is indicative of dyspnea, due to disease of the heart or lungs, especially the chronic forms as emphysema or failing compensation in valvular lesions ; otherwise it may be associated with the associated local diseases of the mouth as stomatitis, glossitis, cacrum oris, phlegmonous tonsilitis, or some form of nasal stenosis), pressed and heated ( loose and pendulous lips are suggestive of diphtheritic paralysis, chronic bulbar palsy ; and associated with open lips it is observed in various conditions of prostration, in idiocy and in cases of insanity ).

"In the '*pitta*' affections of the lips, the lips are bluish (*cyanosed* ), bronzed ( in Addison's disease ), and are covered with many vesicles like mustard seeds which give burning sensation, rupture and exudate ( in aphthous or follicular stomatitis, small vesicles appear on the inner surface of the lips, or cheeks or edges of the tongue and soon rupture, leaving small and

very sensitive superficial grayish ulcers with red areolæ ).

"In the '*kapha*' affections of the lips, the lips are covered with mucous patches like the color of the skin, and they are painless, pruritic, edematous, slippery, tepid and heavy ( flattened, warty outgrowths, strictly delimited, coated with a gray matter, and found at the angles of the mouth, are the mucous patches of the secondary stage of syphilis ; congenital hypertrophy —*macrocheilia*—is caused by distension of the lymphatic space ).

"In the vitiation of the three humors, the lips are sometimes blackish ( cyanosed ), sometimes bronzed ( in Addison's disease ), or pallid ( in anemia ), and are covered with various kinds of eczemas.

"In the labial diseases, originating from the derangement of the blood ( vessels ), the lips are covered with tumors which have color like dates ( reddish brown ), and they contain blood and bleeding takes place from them (*angioma*).

"In the labial diseases, from the corruption of flesh, the lips become heavy and swollen, and the tumors appear like meat balls and germs from the edges enlarge the ulceration ( a somewhat irregular ulcer, usually upon the lower lip,

gradually enlarging, recurrently scabbing over and becoming denuded, is probably an epithelioma ).

"In the adipose labial affection, the lips are pruritic, numb, soft and heavy, and they are bright like the outer layer of clarified butter ; and from them there is a clear exudation like clear crystal ( congenital hypertrophy, *macrocheilia*, is caused by distension and dilatation of the lymphatic spaces, the lower lip being frequently affected ).

"In the traumatic lesions of the lips, there is a terebrant pain, or like that of a wound from an axe, and it becomes like the color of blood ( inflamed ), tumorous ( inflammatory swelling ) and pruritic." *Susruta* II. 16. 5-12<sup>134</sup>.

134. कर्वयी पद्मी लाखी दौड़गचिती ।  
 दाखे ते परिपाञ्चे ते ओडी माषतकोपतः ॥ १ ॥  
 आचिती पिङ्काभिष्टु सर्वपाण्डतिभिर्मूशम् ।  
 सदाहपाकसंबादी गौली पीती च पिततः ॥ २ ॥  
 सवर्णाभिष्टु चौथेते पिङ्काभिरवेदनी ।  
 कष्मूमनी कफाञ्चु जी पिञ्जली शोतकी गुण ॥ ३ ॥  
 सङ्कृतकर्षी सङ्कृतपीती सङ्कृती तर्वय च ।  
 सप्तिपातेन विष्टे धावनेकपिङ्काआचिती ॥ ४ ॥  
 खर्जर्फलवर्णाभिः पिङ्काभिः समाचिती ।  
 रक्षोपहृष्टी दधिरं व्यवः शोचितप्रभी ॥ ५ ॥

*Diseases of the Gum.*

In 'śitāda' the gums are bleeding, ulcerative with foul-smelling exudation, and soft ( spongy ) ; this disease is due to the vitiation of the blood and the 'kapha' (*gangrenous stomatitis*).

In 'danta-puppuṭaka' there is an intense pain and swelling at the root of one or two teeth for a time ; this is due to the vitiation of the 'kapha' and the blood. (*Gum boils* are usually formed round a foreign particle, especially with the tartar deposit encrusted with the pyogenic bacteria, but their outlet of discharge being closed ).

The disease in which the teeth become loose, and from the tooth-sockets blood and pus come out, is called 'danta-veṣṭaka' ( in *pyorrhea alveolaris*, the teeth become loosened as the gum

मासदुटी गुर स्थूली मासपिण्डवद्वगती ।

अक्षवस्त्राव सूर्यनि घुङ्खयोमयतो सुखान् ॥ १० ॥

मेदसा घुतमध्याभी कस्तुमन्ती स्थिरो घट् ।

चक्षुस्तिकस्त्रं काशमाक्षावं चवतो गुरु ॥ ११ ॥

चतुर्भावी विदीर्घेते पाक्षोत्ते चामिधाततः ।

यथितो च सुमालातातोही कस्तु सुमन्ती ॥ १२ ॥

चरकस्त्रिता, निहानस्त्रानम् ॥ १३ ॥

recedes or the pus socket causes necrosis of the tissues at the root. The affection is probably due to streptococcal infection of the periosteum of the alveoli. Usually it is associated with an excess of tartar deposit or the carious condition of the teeth ).

The disease in which the gum has a pruritic and painful inflammation, and salivation, is called the '*sauṣira*' (*gingivitis*).

The disease in which the teeth are loose in their sockets, the palate is falling (*uvula descendens*) and ulceration in the gum and pain in the buccal cavity, is called the '*mahā-sauṣra* (*gangrenous gingivitis*).

The disease in which there is ulceration and bleeding of the gum, is called the '*paridara*' (*phlegmonous gingivitis*).

The disease in which there is necrosis of the tissues in the sockets, and for this reason the teeth become loose, there is bleeding at the slight pressure of the teeth, but slight pain, and with the bleeding the mouth becomes foul-smelling, is called the '*upakusa*' (*chronic hyperrophic gingivitis*).

If strong inflammation follows the traumatism of the gum, and the teeth become loose, it is called '*vaidarbha*' (*traumatic interstitial ulitis*).

If an extra tooth appears due to the influence of 'vāyu' with intense pain, it is called the 'varddhana' (*wisdom tooth* or *dens serotinus*, the most posterior of the molar teeth appear about the eighteenth year). The pain ceases after the tooth comes out.

"The disease in which in the gum of the lower posterior tooth, there is a large neoplasm with intense pain and salivation, is called the 'adhimāṃsa' (*epithelioma* or *epulis*. Epulis is a fibrous growth and develops in the periodontal membrane; it is often found near a decayed tooth, grows slowly and forms a more or less pedunculated tumor of the same color as the gum).

The tumors of the gum are of five kinds with symptoms similar to those that have been described of the tubular vessels, by the corruption of 'vāyu, pitta, kapha', their morbid combination or infection' and they are known as 'pañcha-nādi' (*alveolar abscesses*) are nearly always due to sepsis originating in a decayed tooth. (1) The pus may be limited to the margin of the gum, forming a tumor. (2) The pus may be slow in forming and there may be a great inflammatory infiltration of the cheek with the edema of the face and spasm of the masseter

and pterygoid muscles. (3) The pus may extend widely beneath the periostenum and cause necrosis of the jaw. (4) A persistent sinus or sinuses may be present if the abscess has burst spontaneously or has been opened externally ; there is either a dead tooth, a portion of a fang or a piece of necrosed bone which keeps open the sinus. (5) The pus may burst into the antrum of the upper jaw or extend deeply and widely in the neck)". *Susruta* II. 16. 14-24<sup>138</sup>.

135. शोणितं दनवेष्टेभ्यो यस्याकाशान् प्रवर्तते ।  
 दुर्गम्बैनि सक्लशानि प्रकोदीनि मृदूनि च ॥  
 दनमासानि शौर्यने पचमित च परस्परम् ।  
 शीतादी नाम स व्याधिः कफशोणितसम्बद्धः ॥ १४  
 दनशोणित्यु वा यस्म चयनुः सद्ब्रजो भहान् ।  
 दनपुष्पुटको श्वेयः कफरक्तग्निताळः ॥ १५  
 चवलि पूयदधिरं चक्षा दना भवलि च ।  
 दनवेष्टः स विश्वेयो दुष्टशोणितसम्बद्धः ॥ १६  
 दयदुर्दनमूलीषु दग्धावान् कफरक्तातः ।  
 वालाकाशी स विश्वेयः कश्च मान् शौषितो गदः ॥ १७  
 दनाक्षत्रिणि वेष्टे अक्षाक्षु चायवदीयंते  
 दनमासानि पचमने सुखाच परिपौर्वते ।  
 यज्ञिन् च सर्वजो व्याधिर्महाशौषितरं चक्षः ॥ १८

*Diseases of the Teeth.*

"The disease in which the tooth becomes blackened and perforated by microbes, due to the vitiation of the blood, and the tooth becomes loose accompanied by inflammation of the gum, pain and salivation; is called the 'krimi-dantaka' *dental caries*: it is a fact of common observation that caries begin only at spots protected from friction or left uncleansed as (a) pits, grooves and fissures in the enamel; (b) proximal surfaces just above the contact points; (c) surfaces which for any cause are habitually

दन्तांसानि शौचं को विजिन् द्वावति चाप्यस्त् ।

वित्ताद्वक्षेत्रो व्याधित्वयः परिदर्श हि सः ॥ १९

वेष्टे चु दाहः पाकव तैर्यो दन्तांसानि च ।

चाप्यहिताः प्रवावनि शौचितं मद्विदनाः ॥

चाप्याद्यक्षे चु रक्ते सुखं पूति च जायते ।

शौचित्वं पक्षुषः स ऊद् वित्ताद्वक्षेत्रो गदः ॥ २०

हृष्टे चु दन्तमूलेषु संरक्षो जायते महान् ।

अवनि च चक्षा दग्धाः स वैद्यर्मोऽभिचात्माः ॥ २१

काइसेनाधिको दग्धो जायते तोषप्रदेशः ।

वर्णः च अतो व्याधिर्जाते चक्ष च प्रशाप्यति ॥ २२

कानये विनि दग्धे महाब्लीबो महाहनः ।

कापाक्षावी कफङ्गतो विष्टेयः शौऽधिमासकः ॥ २३

दग्धमूलाक्षावाता जायः पथ चेया यवेरिताः ॥ २४

सुमुतर्द्धिता, निदानसामग्रम्, १६ ।

unclean ; (d) necks of the teeth at or near the junction of the cementum and the enamel. In these localities, the oral bacteria, protected from friction, attach themselves to the enamel, forming microbial plaques which are sufficiently adherent to attach themselves, obtaining their food supply from the carbohydrate and the albuminous particles that adhere to those spots and are not thoroughly cleansed. From carbohydrate fermentation, lactic acid is produced and this is prevented from being diluted and washed away ; the slightly alkaline salivary secretion by the bacterial plaques and added to it, the enzymes secreted by the bacteria, attack the inorganic matter of the enamel following first the interprismatic cement substance between the prisms, later dissolving the transverse cement substance of the globules. The effect is to 'produce an irregular and roughened surface, and in the process of enamel dissolution and decalcification, the bacteria enter into the crevices and gradually gain access to the dentine. The *leptothrix buccalis maxima* is invariably associated with more or less *streptococci* and *bacillus buccalis maximus* in rapid dental caries).

The disease in which the teeth are very

sensitive to cold or heat (paroxysms of pain induced by thermal stimuli), is called the '*danta-harṣa*' (*hyperemia of the dental pulp*: the most common cause of active hyperemia of the pulp is a lessening of the non-conducting covering of the organ—enamel and dentine, through abrasion, erosion, fracture or caries, leading to an increased response and continued irritation of the pulp through the thermal stimuli).

The disease in which the face becomes misshaped (either by caving in through necrosis of the jaw-bone or with odontomes which are neoplasms composed of dental tissues in varying proportions and different stages of development), the teeth become eroded and painful, is called the *bhañjanaka* (*necrosis of the jaw with odontones and erosion of the teeth*).

If the solids (*mala*=the mineral constituents and the mucus of the saliva) are dried up and become sugar-like hard on the teeth, by '*vāyu* and *pitta*' it is called the '*sarkarā*' (*salivary calculus* or *tartar*: the deposition of the tartar is perhaps activated by the bacterial fermentation, causing the precipitation of the mineral salts, chiefly calcium phosphate enclosing with them the epithelium and the bacteria, especially the *leptothrix* forms).

If this tartar scales out with the dentine, it is called the *kapālikā* (large tartar formations) ; it is very destructive to teeth.

If by the vitiated blood and the '*pitta*', the enamel of the teeth become burnt (stained) dark-brownish or greenish, it is called the '*syāva-dantaka*' (*the green stain of the enamel* : these most common green deposits upon enamel occur upon both the temporary and the permanent teeth, particularly of young persons ; the deposits usually have a concentric form and are mainly upon the labial faces of the anterior teeth. The green stain is usually preceded by a lack of oral hygiene and superficial decalcification of the enamel, as it is found slightly roughened, indicating the action of the acids upon it by fermenting food particles sticking to it. The green stain is the more advanced stage of the dark-brownish coloring).

If the jaw is fractured by the source of '*vāyu*' through loud talking, chewing of hard substances or yawning, it is called '*hanu-mokṣa*' (fracture of the jaw) ; it gives all the symptoms of tetanus (the fracture of a healthy jaw is only possible through traumatism. But if it is eaten up by necrotic process as in the tertiary

stage of syphilis, tubercular caries, phosphorus poisoning or local sepsis, and made very brittle, it may be easily fractured by any slight sudden tension as chewing any hard substance or movement). *Susruta* II. 16. 27-33<sup>136</sup>.

Treatment : "Without injuring the gum, all the tartar deposits have to be carefully scaled out ( by scalers ) ; then those parts of the teeth are to be polished with the powder of *Butea frondosa* (*lakṣā*) mixed with honey. ( The modern treatment for the tartar is just the same, except that to secure the smoothness of the

136. लक्ष्मिद्रु चतुः सावी समं रथो महाकृष्णः ।  
 लक्ष्मिनितज्जो वाताहित्येः क्रिमिदग्धतः ॥ २०  
 दग्धनाः शतमुख्यसु दृढूर्णे व्यश्चेन न च ।  
 यस्त तं दग्धहर्वन्तु व्याधिं विद्यात् समं रक्तान् ॥ २१  
 वक्तुं वक्तं भवेद्यज्ञिन् दग्धभृत्यस तं वदक् ।  
 कफवातहतो व्याधिः स भक्तवक्तुर्णितः ॥ २२  
 ग्रंथं विवरीभूतो मसो दर्शनु दस्य च ।  
 सा दग्धानां गुणज्ञो तु विज्ञेया दग्धशक्तान् ॥ २०  
 दग्धं त्वं दग्धवल्क्यानि यदा व्यक्तरया सह ।  
 ज्ञेया कपालिका सौव दग्धानां विलासिनी ॥ २१  
 वोडगृह्णिनि च पित्तेन दग्धो दग्धं श्रेष्ठतः ।  
 आवतां गोकर्ता वापि नतः स आवद्यतः ॥ २२  
 वित्तेन तंकोर्मादिषु इन्द्रियिर्विसंहतः ।  
 हुग्मेच इति ज्ञेयो व्याधिरहितवच्छयः ॥ २३  
 सुश्रुतसंहिता, निदानस्थानम्, १५ ।

scaled surface, so that no nucleus is left for the new tartar deposit, pumice-powder on a piece of wood is used, instead of the powder of *Butea frondosa* with honey)." *Susruta* IV. 22-23<sup>157</sup>.

"The alveolar abscesses should be treated in the same way, as an ordinary abscess, with this difference, that the tooth with the sepsis of which the abscess has been formed, must be extracted. If it can not be done, then after cleansing (an incision is made, large enough to open the abscess cavity fully, inside the mouth, all the pus is thoroughly drained off, and the abscess cavity is repeatedly washed with antiseptic and astringent infusion or decoction), the abscess cavity should be cauterized either by caustic or cautery. If the alveolar abscess is neglected, it is sure to cause necrosis of the jaw. Therefore the tooth should be uprooted (thus cure may be effected in light cases, by causing the abscess drainage through the tooth socket). If the bone has

137.

चहिंसन् दन्तमूलानि वर्जराहुवरेद्भिषण् ।

वाचाचूचे रंभुतेतत्काः प्रतिवारयेत् ।

सुनुनम् हिता, चिकित्सितकानम्, ३२ :

been affected (necrosized), it should be also scraped off." *Susruta* IV. 22. 18<sup>131</sup>.

"The disease in which the teeth seem to be rent asunder with pain, is called 'dālana' (odontalgia of neuralgic character or due to caries or periodonitis)." *Susruta* II. 16. 26<sup>132</sup>.

### *The Diseases of the Tongue.*

"The disease in which the tongue becomes inflamed, due to the derangement of 'vāyu', loses its sensibility to taste, and becomes fissured like that of the leaves of 'teclona', is the 'vāta' disease of the tongue ( glossitis desiccans or chronic superficial glossitis may be induced by

138. सामान्यं कर्म नाडीना विशेषज्ञात मे यृष्टु ।  
 यं दक्षतमभि जायेत नाडी तं दक्षतसुदरेत ॥  
 हिंगु भासानि शस्त्रेण यदि गोपरिजो भवेत् ।  
 बोधयित्वा दहेवापि खारिण ज्वरनेन वा ॥  
 लिङ्गायेचिन्ते दक्षते हनुकास्थिगतिभ्रवम् ।  
 समूच्छ दशनं तथा दुखरेद्भप्रमस्य च ॥ १८  
 सुशुतस्त्रिता, चिकित्सितस्थानम्, २२ ,

139. दात्यन्ते वहुधा दन्ता यक्षिंस्त्रव्रहगन्विताः ।  
 दात्यनः स इति च्चेयः सदागतिनिमित्तशः ॥ २६  
 सुशुतस्त्रिता, निदानस्थानम्, १५ ।

persistent and excessive use of tobacco, spirits and highly spiced foods ; it is characterized by the slow formation of a number of deep fissures and indentations, in the depth of which there are ulcers and excoriations).

"The tongue is dark-yellowish, congested and is covered with blood-red fissures in the '*pitta*' disease of the tongue (the raspberry tongue has a pale-red surface, from which project greatly swollen and bright-red fungiform papillæ, as it appears in the first stage of the scarlet fever or in other acute specific infections ).

"The tongue is swollen, heavy and is covered with a fur, resembling the thorns of '*Bombacis heptaphylli*' in the '*kapha*' derangement of the tongue (the tongue is flabby, swollen, indented and covered with a uniform, yellow pasty fur in catarrhal gastritis or gastro-duodenitis ).

"The severe inflammation that is caused in the tongue by the corrupt '*kapha*' and the blood, is called the '*alāsa*' (glossitis) ; in severe cases paralysis of the tongue and ulceration at its root, (*cellulitis* or parenchymatous inflammation of the tongue is due to the infection of streptococcus ; while acute glossitis may be the result of a burn or wasp-sting ).

The disease in which the tongue is inflamed and on the tip of the tongue, there is a salivating, pruritic and painfully congestive tumor, is called 'upajihrikā' (secondary syphilitic sore, usually as condylomata, accompanied by subacute glossitis, arising from the primary hard or tender ulcerating nodule that is seen on the tip of the tongue in a syphilitic lesion ; or it may be carcinoma of the tongue.)" *Susruta* II. 16. 37<sup>140</sup>.

### *The Diseases of the Palate.*

"The elongated tumor that develops and spreads from the bottom of the palate like a leathern bag filled with air, is called *galaśundikā* (angioma of the palate) ; it causes polydipsia, bronchitis and dyspnea (in uvulitis).

"The tumor that develops at the bottom of

१४०. जिहानिलेन स्फटिंगा प्रसूषा भवेच्च शाकच्छदनप्रकाशा ।

पित्तेन पीता परिदद्धे च चिता सरकैरपि क्षटकैश्च ।

कफेन गुठ्ठी न्दुला चिता च मांसोद्भैः शालमलिकश्टकाभैः ॥ ३५

जिहात्तजे यः शथुः प्राणादः सोऽलाससंहः कफरक्षमूर्तिः ।

जिहा स तु स्तम्भण्टि प्रबृद्धो भूलोऽतु जिहा मृथमेति पाकम् ॥ ३६

जिहाप्रलः शथुः हिं तज्जामुन्नम्य जातः कफरक्षयोनिः ।

प्रसेक्ष्य इपरिदाहयुक्ता प्रकृत्यतेऽसामुपजिर्हिकेति ॥ ३७

सुन्दुर्हिता, निदानस्थानम्, १६ ।

the palate ( an acute abscess from a carious tooth in the upper jaw may spread inwards and raise the muco peristeum of the hard palate) like the ( fruit of ) '*Memordica monadelpha*' ; it causes pricking pain and *hyperæmia* and it suppurates (*septic tumor of the palate*).

"The reddish and the benumbing tumor that develops in the palate, is called the '*adhrusa*' ( the *peritonsilar abscess* is liable to burrow in the soft palate ) ; it causes high fever and intense pain.

"The slightly painful and pale tumor that develops slowly for a long time like the tortoise shell, due to the corruption of '*phlegma*' is called the '*māmsa-kachchupa* (*endothelial tumor of the palate*) .

"The tumor that appears in the palate like the lotus bud, is called the '*arvouda*' (*angioma*) ; it has all the characteristics of the angioma as mentioned before.

"At the base of the uvula, the malignant and painless carcinoma that grows, is called the '*māmsa-suṅghāta*' (*papilloma of the uvula*).

"The painless and the chronic tumor that grows in the palate like a plum, due to the corruption of the '*phlegma and fat*', is called the '*tālu pupputa*' (*cyst or gumma of the palate*).

There is much edema and lacerating pain in the palate, and dyspnea, due to the derangement of *pitta* associated with *vāyu* which causes *tālu-sōsa'* when the syphilitic gummata break, septic infection follows, and thus there is usually much edema of the surrounding tissues.

There is malignant ulceration of the palate due to the derangement of '*pitta*', which causes '*tālu-pāka'* (*syphilitic ulceration* of the palate which may lead to its perforation, usually circular or oval in shape, and finally to its necrosis and destruction of its major part)".  
*Suśruta* II. 16. 39-47<sup>141</sup>.

141. श्लेष्मासूक्ष्म्यां तालुमूलात् प्रवृद्धो  
 शीर्षः शोफ्लेघ्मातवस्तिप्रकाशः ।  
 तृष्णाकासश्वासकृत् संप्रदिष्टो  
 व्याख्यावैर्यैः क्षारगुणडीति नाम्ना ॥ ३६  
 शोफः स्थूलस्तोददाहप्रपाकी  
 प्रागुकाम्यां तु गिरिकेरी मता तु ॥ ४०  
 शोफः स्तवधो हीहितस्तालुदेशो  
 रक्ताञ्जशेयः सोऽभ्युपो स्त्राजवरात्पः ॥ ४१  
 कूम्भोत्तसज्जोऽवेष्णोऽशीघ्रजन्मा-  
 उक्फो ज्ञेयः कर्णदृपः श्लेष्मवा स्वात् ॥ ४२  
 पश्चाकारं तालुमध्ये तु शोफं  
 विद्याद्रकादर्ढ्यु वृ प्रोक्तलिङ्गम् ॥ ४३

*The Diseases of the Throat.*

'The gummata that are produced in the pharynx, causing its stricture, due to the vitiated action, either individual or collective, of 'vāyu, pitta, kapha and the blood,' are called the 'rohiṇī' (*syphilitic gummata*) ; due to the pharyngeal stenosis, life is lost (unless it is treated by the regular passage of bougies for the rest of the patient's life, and in some intractable cases gastrostomy may be necessary).

The painful gummata, causing stricture of the pharynx, also appear at the dorsum of the tongue in the 'vāta' gummatous affection of the pharynx ; and it has all the complications of the 'vāta'.

The *gummata* appear and ulcerate rapidly

दुष्टं मांसं रसेभ्यवा नीरुजन्व  
तास्वन्तःस्थं मांससङ्कृतमाहुः ॥ ४४  
नीरुक्स्यायी कोलमात्रः कफात् स्था-  
न्मेदोयुक्तात् पुष्पुटस्तालुदेशे ॥ ४५  
शोषोऽस्थर्थं दीर्घ्यते चापि तालु  
शासो वारात् तालुशोषः स पित्तात् ॥  
पित्तं कुर्यात् पाकमत्यर्थघोरं  
तास्म्बेन तालुपाकं वदन्ति ॥ ४६  
समुत्संहिता, निदानस्थान, म् ११

with high fever in the 'pitta' affection of the disease.

The gummata (or syphilitic nodes) are hard and ulcerate freely in the 'kapha' affection of the disease, and they cause stricture of the pharynx.

The gummata ulcerate deeply and are very intractable and have all the triple complication in the 'sānnipāta' (acute) affection of the disease.

The gummata have all the symptoms of the 'pitta' affection of the disease, and are covered with the abscesses in the blood lesion of the 'rohini'; it is incurable.

A plum-stone like (*zizyphus jujubae*), rough and hard tumor that develops and causes tercbrant pain, is called 'kaṇṭha-sālūka' (*carcinoma of the pharynx*) ; it is curable by operation.  
*Susruta* II. 16. 49-55<sup>142</sup>.

142.

गलेऽनिलः पित्तकौ च मूर्च्छतौ  
पृथक् समस्ताश्च तथैव शोणितस् ।  
प्रदूष्य मांसं गलरोधिनोऽहुरात्  
सुजन्ति यात् सास्थहरा तु रोहिणी ॥ ४६  
जिह्वां समन्ताद्भृशवेदना ये  
मांसाङ्कुराः कण्ठनिरोधिनः स्युः ।  
तां रोहिणीं वातहृतां वदन्ति  
वातात्मकोपद्रवगाष्टुकाम् ॥ ५०

If a tumor ( syphilitic or tuberculous cancer ) appears at the root of the tongue due to the vitiation of the '*kapha and the blood*' as it appears on its tip, it is called '*adhi-jihvā*' (*cancer of the tongue*) ; and if it suppurates, it is incurable.

The tumescence that develops like a bracelet and causes the stricture of the esophagus, is called the '*valaya*' (*hypertrophic thickening in the phreno-cardiac portion of the gullet*) ; it is intractable and incurable.

The inflammation that causes dyspnea, pain and devitalising, due to the derangement of '*kapha and vāyu*' is the '*valāsa*' (*stenosis of the trachea*, caused by acute edematous inflammation from diphtheria and specific fevers, sometimes leading to perichondritis and erysipe-

किप्रोद्धरा किप्रविदाहपाका  
तीज्ज्वरा पित्तनिमित्ततः स्थात् ॥ ५१  
ज्वोतोनिरोधिन्यपि मन्दपाका  
गुब्दीं स्थिरा सा कफसम्भवा वे ॥ ५२

गम्भीरपाकाप्रतिवारवीर्यां त्रिदोषलिङ्गा ग्रयसम्भवा स्थात् ॥ ५३  
स्फोटाचिता पित्तसमानलिङ्गाऽस्वाध्या प्रविष्टा दधिरात्मकेयम् ॥ ५४  
कोलास्थिमात्रः कफसम्भवो यो ग्रन्थिर्लिंगे कण्ठकाश्यकभूतः ।  
स्वरः स्थिरः शरनिपातसाध्यस्तं कण्ठाश्यकभिति ब्रुवन्ति ॥ ५५  
समुत्संहिता, निदानस्थानम्, १६ ।

las spreading down the throat or spreading to the mucosa through a tracheal wound); this is hard to cure.

The globular, elevated, congestive, pruritic, slightly suppurative, sweetish and heavy inflammation that is developed in the tonsils, due to the vitiation of '*kapha and the blood*', is called the '*eka-vrnda*' (phlegmonous or suppurative tonsilitis).

The elevated and the globular inflammation that develops with high fever and '*hyperænia*'; is called the '*vrnda*' (follicular or *lacunar tonsilitis*); if it be of '*vāta*' origin, it causes pricking pain.

The hard tumor that develops causing stricture of the esophagus, due to the corruption of the humors, resembling '*Sataghni*' which is a stone covered with iron pikes, and likewise the tumor that is covered with papillæ, is called the '*sataghni*' (*papilloma*); it is an incurable disease, and it has all the complications of the three corrupt humors (malignant papilloma of the esophagus).

The hard and slightly painful tumor that develops in the esophagus, causing dysphagia, and resembles in appearance and shape the stone of '*Emblic myrobalan*', is called the

'*gilāyu'*( benign fibroma of the esophagus ). It is curable by operation.

The tumescence that develops throughout the throat, due to the corruption of the three humors, is called the '*gala-vidradhi*' (*parenchymatous goitre* in which there is a general and uniform enlargement of the thyroids and the vesicles are over-distended with colloid secretion, which however does not escape freely into the lymphatics); it causes all kinds of pain of the corrupt humors, as pricking pain, hyperæmia and pruritis, and has all the complications of an acute abscess (*parenchymatous goitre* may be provoked by septic absorption from a local septic lesion as carious tooth, an ulcer, suppurative tumor or drinking water from a contaminated source).

If such a large tumor develops in the esophagus, due to the corruption of the '*kapha and the blood*,' as to cause aphagia, dyspnea and high fever, it is called the '*galaugha*' (a large *epithelioma* that causes the stricture of the esophagus and the trachea).

The disease in which, due to the stenosis of the trachea, the patient suffers from dyspnea and falls into a swoon, the voice is broken, the throat becomes dry and the patient collapses, is

called the 'svaraghna' (*stenosis of the trachea*) may be caused by many diseases as : (1) enlargement or neoplasm of the thyroids ; (2) enlargement and the tumor of the thymus ; (3) mediastinal tumors or abscesses ; (4) pressure stenosis by aneurism ; (5) tertiary syphilitic lesions ).

The disease in which there is an extensive, very painful and continuous inflammation which gradually causes stenosis of the throat, is called 'māmsa-tāna' (*syphilitic ulceration of the throat*) ; it is deadly and arises from the corruption of the three humors.

The disease in which there is a bleeding inflammation with pricking pain and hyperæmia and which ulcerates with cadaverous odor, especially on the side the patient sleeps, is called the 'vidāri' (*syphilitic gangrenous ulceration of the throat*). *Susruta* II. 16. 56-67<sup>143</sup>.

143. जिहाप्रस्तुः शयथः कफात् तु जिहाप्रबन्धोपरि रक्तमिश्रः ।  
 शेयोऽधिजिह्वा खलु रोग एष विवर्जयेदागतपाकमेनम् ॥ ५६  
 वसास पृवायतमुद्भवतन्व शोफं क्षोत्यङ्गर्ति निवार्य ।  
 तं सर्वथैवाप्रतिवारवीर्यं विवर्जनीयं वस्य वदन्ति ॥ ५७  
 गले च शोफं कुस्तः प्रहृदौ श्लेष्मानिलौ आसर्जोपपञ्चम् ।  
 मम्मच्छ्वद दुस्तरमेतदाहुर्वलाससंज्ञं निषुणा विकारम् ॥ ५८  
 शृष्टोद्भवो यः शयथुः सदाहः कण्ठन्वितोऽप्याक्षयद्युगुर्लक्ष्य ।  
 नाम्नेकवृन्दः परिकल्पितोऽसौ व्याख्यावलाससहतजप्रसूतः ॥ ५९

*Diseases of the Buccal Cavity.*

The buccal cavity is covered with ulcers with pricking pain in the '*vāta sarvva-sara*' (*ulcerative stomatitis* or putrid sore of the mouth occurs in oral sepsis, especially associated with carious tooth or pyorrhea).

The buccal cavity is covered with small reddish or dark-yellowish vesicles (small, slightly raised whitish plaques starting as vesicles, surrounded by a red areola) in '*pitta sarvva-sara*' (*aphthous* or *follicular stomatitis*, which is very

स्मुच्चतं शूसममन्द्यदाहं  
तीव्रज्वरं दृन्वलुपाहरन्ति ।  
तन्त्रापि पित्तहतजप्रकोपाद्  
विद्यात् सतोदं पवनात्मजं तम् ॥ ६०  
वर्तिर्वना क्षणिरोधिनी या  
चितातिमान्नं यिगितप्रतोहे ।  
नामारुद्धोच्छ्रायकरी निदोषाद्  
हेवा शतग्रीव शतञ्चसाभ्या ॥ ६१  
ग्रन्थिर्वर्गे स्वामसकास्थिमानः

संलक्षणे सरकभिवायन्त्र  
स शस्त्रासाध्यस्तु गिलायुर्संज्ञः ॥ ६२  
सर्वं गलं व्याघ्रं समुत्पितो यः  
योक्ते रुग्मो यत्र वसन्ति सर्वाः ।

common in infants and young children associated chiefly with indigestion, but also prevails in adults when the general health is impaired ).

The buccal cavity (especially on the tongue and the inner margins of the lips) is covered with pruritic, slightly painful and skin-colored

स सर्वदोषो गलविद्विष्टु  
तस्यैव तुरुणः सातु सर्वजल्प ॥ ६३  
योक्तो महान्नाजसावदोधी  
तीव्रज्वरो वातगतेनिहस्ता ।  
कफेन जातो हविराम्बितेन  
गले गलौषः परिकीर्त्यतेऽसौ ॥ ४  
योऽतिप्रताम्यन् शस्ति प्रसर्त  
भित्तस्वरः शुच्चविमुक्त क्षणः ।  
कफोपदिव्यव्यनिसायनेषु  
शेयः स रोगः शसनात् स्वरमः ॥ ६४  
प्रताम्बान् यः शययुः कुरुटो  
गलोपरोषं कुरुते क्रमेषु ।  
स मांसतानः कमितोऽवलम्बी  
प्राणप्रदात्र सर्वदृष्टो विकारः ॥ ६५  
सदाहतोदं शययुँ सरक-  
मन्तर्गते पूतिविदीर्घमांसम् ।  
पिसेन विद्याहृदने विदारीं  
पाशे विशेषात् स तु येन शेते ॥ ६६  
क्षमुत्कसंहिता, निदानस्थानम्, १६ ।

patches in 'kapha sarvva-sara' ( *mycotic or parasitic stomatitis* in which small, slightly elevated, pearly white spots are developed through 'saccharomyces (odium) albicans' in debilitated children and old people ).

All the symptoms of aphthous stomatitis appears in stomatitis from blood vitiation, and by many authorities, it is called the 'mukha-pāka' ( *acute or catarrhal stomatitis* in which the mucosa membrane of the mouth is more or less extensively reddened, dry and hot, with associated salivation and swelling of the tongue, due to gastro-intestinal disturbances or due to irritants as alcohol or tobacco )" *Susruta* II. 16. 69-72<sup>144</sup>.

144.

स्फोटः सतोदैर्घ्यदनं समन्ताद्  
 यस्याचितं सर्व्वसरः स वातात् ॥ ६६  
 रक्षः सदाहैस्तनुभिः सपीते-  
 यस्याचितं वापि स पित्तकोपात् ॥ ७०  
 कण्ठूयुतैरल्परुजैः सवर्णे-  
 यस्याचितम्बापि स वै कफेन ॥ ७१  
 रक्षेन पित्तोद्दत एक एव  
 कैरिक्तु प्रदिष्टो मुखपाकसंज्ञः ॥ ७२  
 सुश्रुतसंहिता निदानस्थानम्, १४ ।

### *VI. Tumors.*

"*Tumor (granthi), abscess (vidradhi), neoplasm (alaji* perhaps means edema, as *arvvuda* has been definitely defined as neoplasm), all develop from *inflammation (Sotha)*. They have all their own individual characteristics, and tumors are of various kinds. The swelling that is extensive, slightly elevated, of even or uneven surface, in the skin (including mucous membrane) and the tissues, confined to a part of the body due to a lesion, is called the '*sotha*' (inflammation)."

*Susruta I. 17. 2<sup>145</sup>.*

"*Sotha*" is of three varieties, '*rāyu, pitta and kapha*'. Either they originate from internal causes (in the process of eliminating toxins produced as a metabolic reaction, or, introduced into the economy) or external lesions (as traumatism, microbial invasion or local irritants). Cutting, penetrating, crushing, lacerating, pressing, beating, binding and all kinds of wound and oppression of the tissue cause inflammation; as well as the contact of the (toxic or irritant sub-

145. शोफस्त्वाना ग्रन्थिविद्ध्यलजीप्रभृतयः प्रायेण व्याघ्रो-  
भिव्याघ्रन्ते अनेकाहृतयः, तैर्विलक्षणः पृथुर्ग्रथितः समो विषमो वा  
त्वद्भूमांसस्थावी दोषसङ्कृतः शरीरकदेशोत्पत्तिः शोफ इत्युच्यते ।

दशुत्संहिता, सत्रस्थानम्, १० ।

stances) flower, fruit or juice of 'Semecarpus anacardium', sting of insects ( mucuna pruritus ) and ( penetration ) of microbes ( krimi ), at the contact of injurious leaves, vines and bulb ( as that of the poison ivy, *Rhus radicans* ), the perspiration, or excreta of a poisonous creature, a wound of a poisonous or non-poisonous creature by tooth, horn or nail, poisonous gas ( *visha vātz* ) and fire—all these cause inflammation." *Charaka I.* 18. 1<sup>146</sup>.

"Vomiting, tympanites, cholera, dyspnea, asthma, diarrhoea, tuberculosis, anemia, gastro-intestinal troubles, menorrhagia, fistula-in-ano, and piles by osmosis (*ati-karṣana*=excessive pressure) cause (edematous) inflammation." *Charaka I.* 18. 4<sup>147</sup>.

When the tissues are injured by mechanical

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146. श्वः शोथा भवन्ति वातपित्तकफनिमित्ताः । ते पुरुद्धिविधाः  
लिङ्गागम्नुभेदेन । तत्र आगन्तवर्षेदनभेदनक्षयानभज्जनपिच्छनोत्रपेण्यवेष्टन  
प्रहारवचवन्धनव्यवधनपीडनाविनिर्वा । भृष्टातकपुष्पफलरसात्मगुणाद्युक्तिभिं  
शूकाहितप्रद्रवतागुलमसंस्पर्शनैर्वा स्वेदपरिसर्पणावमूलणैर्वा विचिर्वा ।  
सविवाविषप्रायिदन्त्विषादवसन्निपातैर्वा सागरविषवातहिम्बद्वासंस्पर्शनैर्वा  
शोथाः समुपजायन्ते ॥ तत्रकस्तिहिता, सूत्रस्थानम्, १८ ।

147. दृष्टसत्त्वविष्विकाधासकासातीसारपोषपागद्युरोगोदप्रदेशमा-  
म्बद्वायौविकारातिरिक्ष्यैर्वा । चरकस्तिहिता, सूत्रस्थानम्, १८ ।

agents, or, by chemical, thermic or bacterial irritants or their toxins, inflammation sets in as a restorative process of the tissue repair.

When a mechanical agent has produced a cut, the edges of the wound are slightly separated, and the open vessels are bleeding. The first reactions will arrest the hemorrhage. On the one hand, the calibre of the vessels will contract in consequence of the direct excitation of the nonstriated muscular fibers entering into the structures of their walls, and on the other hand as the result of reflex constriction. The blood flowing with less force, will coagulate; fibrine will be formed, and its effect will be to occlude the vessel, to assure hemostasis and to unite the edges of the wound, and then serve as a nutrition and as a guide to cells which will insure reparation. This commences when the cellular elements lining the wound begin to proliferate and form a cicatrix. To facilitate the work, the leucocytes rush in, some to take part in the formation of the tissues and others to carry away the dead cells. This causes *inflammation*.

The same phenomenon occurs, with a chemical irritant or toxin; if it be weak and diluted, it might be absorbed and neutralized without any perceptible local reaction. But if it is

strong enough to destroy a few cells, then there is a vaso-dilatation, a serous exudation (*edema*) to dilute the toxin and to prevent its absorption.

But if these wounds are not kept in aseptic condition, the ubiquitous pus coccus (*staphylococcus* or *streptococcus*), finding favourable medium, starts a colony. It not only multiplies rapidly, but also engenders toxins which cause death of the cells of the region, thus creating a necro-biotic area, surrounded by a proliferative zone of the healthy tissues. Struggle now begins between the invading hosts and the healthy tissues. If the victory is quick with the latter, then the inflammation gradually subsides. But if the tissues lack the resisting power and the bodily defensive mechanism is not powerful or prompt in its response, then leucocytes circumscribe the infection, round the dead cells, so that the general economy can not be affected, and they can fight more conveniently against the microbes and replace the fallen defenders. Coincidently the nervous terminations are aroused by the microbic toxins and their excitation gives rise to a series of reflex acts which ending in the active dilatation of the vessels of the invaded area, are follow-

ed by migrations of the leucocytes and the formation of the serous exudate. If the pus cocci gain the upper hand, the cells that are killed undergo liquefaction and are converted into the *pus*, so that an *abscess* results. This soon coagulates and a creamy substance is formed which softens towards the centre. And if it be not now evacuated, the softened area increases in size, the skin over it is thinned and mortified, and a small slough is formed, through which the pus escapes and the tension is relieved. If the pus cavity contains aropy fibrile core, as in a boil or carbuncle, it indicates that the cells have been destroyed in mass by a virulent agent, and of the dead cells, the core is composed. After the escape of the pus, a space—the abscess cavity, is left, the walls of which are lined with vascular or granulation tissues, which escaped destruction, and which slowly fill the contracting cavity and obliterate it by forming interstitial *scar-tissues*. But if the abscess be deeply situated and be not able to open on to a free surface, thus allowing the pus to be drained off, the phagocytes mobilize all their forces, surround the necrotic area and make an advance from all sides. The vanguard of the advancing army is

composed of a more or less compact layer of the mono-nuclear phagocytes (*polyblasts*) accompanied by numerous new vessels which bring the food-supply for the phagocytic scavengers who voraciously ingest all the enemy microbes as well as the injured and dead cells, and carry out their removal from the fighting zone. They also drain off the toxic fluid of the disintegrating cells. Behind the polyblasts, are seen in mighty battle array, the fibroblasts or connecting tissue cells in active proliferation, and with their fibrous laminæ shut off the abscess from the healthy tissues, and with the absorption of the pus, encroach on the pus area. With the absorption of the pus, the abscess cavity is replaced by the fibrous tissue, forming the cicatrical scar. But in case the phagocytes lack the necessary vitality for the operation, the abscess burrows through and forms a dangerous fistula (*visarpa nādi*).

Tumors are developed in these eight places : skin (pustular inflammations : acne, ecthymoses, variola ; subcutaneous inflammation : erysipelas, eczema ; vesicular lesions (herpes) or bullæ varicella, pemphigus), flesh (*myxoma* = tumor of mucous tissue ; *fibroma* = tumor of fibrous tissue ; *lipoma* = tumor of adipose tissue ; *myoma* = tumor

of muscular tissue ), vessels ( *angioma*—tumor composed of blood vessels ; *endothelioma*—tumor originating from the endothelium or lining cells of the vascular tissue ; *hemangioendothelioma* = tumor of endothelium of the blood-vessel ; *lymphangioendothelioma* = tumor of the endothelium of the lymphatic vessel ; *endothelioma* = tumor composed of both endothelial and muscular elements ; *lymphangioma* = tumor of the lymphatic vessels ; *aneurism* = a blood-containing tumor connecting directly with the lumen of the artery or formed by circumscribed enlargement either axial or lateral, of an artery ) ligament (*snāyu* perhaps included soft cartilage: *chondroma* = cartilaginous tumor), bone ( *osteoma* = bony tumor ; *odontoma* = tumor of dental structure), joints ( *arthromeningitis* = inflammation of the joints ; *synovitis* = inflammation of the synovial membrane, especially that of a joint ), nerve (*snāyu*: *neuroma* = tumor in connection with nerves ; *glioma* = neuroglial tumor ), viscera ( *papilloma*, *adenoma* = epithelial tumors ; carcinoma is malignant ) and in vital organs." *Susruta* I. 22. 2<sup>148</sup>.

148. त्वङ् मांसशिराज्ञाय्वस्थिसन्धिकोष्ठमर्माणीत्यष्टौ ब्रणवस्तुनि,  
अत्र सर्वत्रयसङ्गिवेशः ॥ २ उश्रुतसंहिता, सूत्रस्थानम्, २२ ।

"Now we shall describe the exudation of tumors. If the skin is bruised or lacerated, or in skin-tumors ( varicella, acne, eczema etc.), whether spontaneously or when lanced, an aquatic, slightly acid-smelling and light-yellowish exudation (serous fluid mixed with sebaceous secretion) comes out. The evacuation of an abscess in the flesh, is like clarified butter, thick, whitish and slimy (*caseous or cheesy pus*—a very thick, almost solid pus resulting from the absorption of the liquor puris). In a recent incision of a blood vessel there is an excessive bleeding from the vascular swelling ; if it suppurates, the pus flows from it as from a water-pipe (*toya-nāḍī*), thin, unmixed, viscous, flaky (caseous flakes consisting of necrosed or sphacelated cells and fatty acids, floating upon the serous fluid) and has a pale brownish color (*serous or curdy pus*). The exudation from a '*snāyu*' ( nerve or ligament tumor ) is creamy, thick, mixed with blood and is like the mucous from the nose (*phlegmonous or laudable pus* which is a yellowish-white, creamy, thick and odorless liquid ). If a bone is wounded or fractured, a kind of pearly white exudation comes out ; but that of an osseous tumor is mixed with bone-marrow, blood and fat ( the pus of osseous origin contains fat and often small splinters of

bone). If an inflammatory joint (tumous joint) is pressed, no exudation comes out; but on contraction, extension, standing on the toes, sitting low, pressure sitting, spasmic tension brings out an exudation which is viscous, flaky, foamy and is mixed with blood and pus (suppurated synovia). From the visceral tumors, are evacuated blood, urine, fecal matters, pus and serous fluid (there may be found in pus foreign bodies, tissue fragments, elastic fibers, animal or vegetable parasites, hydatids, actinomycets, organic liquids, bile, milk, urine, fecal matters and alimentary fragments. Their finding is of great importance from a semiological standpoint, indicating as to the origin of pus and as to the possibility of organic fistula). As to the exudations of the tumors of the vital organs, nothing is mentioned, for they belong to the same category of tumors of the skin and flesh (mucous membrane and the muscular and adipose tissues). *Susruta* I. 22.

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149. अत ऊङ्गुं सर्वसावान् वद्यामः । तत्र शृणुष्टु चिक्षासु वा  
स्त्वनु एकोटु भिन्ने बिदातितेषु वा सलिलप्रकाशो भवत्याद्यायः किञ्चिद्विज्ञः  
पीतावभासश्च । मांसातः सर्पिःप्रकाशः सान्द्रः श्वेतः पिच्छलश्च ।  
शिरागतः सद्यश्चिक्षासु शिरासु रक्तातिप्रवृत्तिः पकातु च तोयनाडीभिरिव  
जोयागमनं, पूर्यस्याज्ञावश्चात्र तनुर्विच्छिन्नः पिच्छलोऽवलः त्री श्यावोऽवरयाय-

*The color of the pus* is no less variable (*Susruta* IV. 1. 8-17). Usually yellowish, it may be of orange, brownish red or greenish color. There is no suppuration presenting blue color, but it is occasionally seen due to the pigment produced by bacillus pyocyanus which is not pyogenic by itself. However, there is no relation between the color of the pus and the cause which develops it, but on the locality where it is formed and imbibe the coloring matter, with the only exception of the suppuration of the pneumococcic origin, which is thick, greenish and rich in fibrine, often having the aspect of the false membrane. In subcutaneous or pleural collections the pus is phlegmonous, thick; in meningeal membranes of the brain, it is greenish; in the liver, of the chocolate color; and reddish in the

प्रतिमश्च । आदुणतः स्त्रिधो धनः सिंहाणकप्रतिमः सरक्तश्च । अस्त्वि-  
गतोऽस्त्रियन्वयनिहते स्फुटिं भिजे दोषावदारिते वा दोषभक्षितत्वादस्थि-  
निःसारं गुह्यिशैतमित्यभावति । आश्रावश्चात्र मञ्जस्मिश्चः सरुधिरः स्त्रिधश्च  
सन्धिगतः दीड्यमानो न प्रवर्तते, आकुञ्चनप्रसारणोऽवलम्बनविनमनप्रधावनोत्-  
कटासनप्रशाहणेऽप्य श्रवति । आश्रावश्चात्र पिच्छिलोऽवलम्बी सफेनपूर्व-  
रुधिरेऽमथितश्च । कोष्ठगतोऽसृष्टुमूगुणुरीपपूर्योदकानि श्रवति । मर्मगता-  
स्त्वनादिप्यवद्वत्वासोच्यते ॥ ६

lung. When it is of osseous origin, it often contains fat and small splinters of bone. If it takes origin in the glands of the skin, it produces a furuncle or a carbuncle--lesion, remarkable for the presence of sphacelated fragments of the cellular tissue, which constitutes the core.

*Pyogenic agents* : Pyogenic agents which can cause suppuration are numerous. (1) Bacteria habitually pyogenic : *Staphylococcus aureus* and *albus*, *streptococcus*, *pneumococcus*, *colon bacillus* and *micrococcus tetragens* are normally encountered upon our integuments and though in healthy condition of the tissues they usually live a harmless saprophytic or vegetative life, yet when the tissues are damaged or injured, and therefore are incapable of offering natural resistance to encroachment, they are particularly apt to provoke suppuration. Of them staphylococci are the most common pathologic agents, but take nearly 250,000,000 to 1,000,000,000 of them to provoke an abscess. (2) Specific pyogenic bacteria are yet recognized to be only three, namely : *gonococcus*, the *bacillus of soft chancre* and the *bacillus glanders*. (3) Bacteria accidentally pyogenic are those which cause specific and well differentiated lesions of their own, but may, also, cause suppuration under

certain conditions, as the tubercle bacillus causes cold abscess, and typhoid bacillus pus in the bone. (4) Pyogenic fungi are the streptothrix, pergillus and odium. (5) The animal pyogenic parasites are the amoebas of dysentery which not only provoke ulcerations of the intestinal mucous membrane, but also abscesses in the liver, and the syphilitic spirocheta which may cause gumma and its ulceration. Gangrene is the morbid process characterized by the mortification (*necrobiosis*) and the putrefaction of the tissues. The microbes causing gangrene act upon the altered tissues by interrupted circulation, by humoral changes or by the interference of the arterial circulation, especially in the extremities exactly as they would act upon the tissues of the cadavers. But between gangrene and the cadaveric putrefaction, there is this difference, that in the gangrene, the affected parts are still the seat of certain biotic reactions, as all the cells are not equally attacked by the bacteria and quite a few survive ; and moreover, there is partial influx of serum, lymph, venous blood and blood pigments and the bacteria attacking the exudate produce new fermentations therein.

"The ingestion of heavy, unsuitable, dry, rotten, or disharmonious combinations of foods,

venery, excessive exertion (fatigue), retention of the feces and the urine, and inflammatory beverage provoke bulbous abscess like an ant-hill, either by particular lesion or by their combined effects. In the anus, neck of the bladder, abdomen, axilla and the groin (*bubo-an* inflammatory swelling of the lymphatic gland, usually leading to suppuration), kidneys (*vrkka*), spleen, liver and the lung abscesses are formed with the symptoms of superficial abscesses (*furuncles or boils*)” *Susruta* II. 9. 13-14<sup>150</sup>.

“In abortion or injurious delivery, a woman suffers with fever ‘hyperæmia’ from dangerous blood-abscess (*rakta-vidradhi = septico-pyemia* : if the entire organism is invaded by bacteria which are usually introduced through the septic handling of the genital puerperal wounds, it is

150. गुर्वसात्म्यविरुद्धाभ्युष्कसंक्षिप्तभोजनात् ।  
 अतिब्यवायव्यायाम-वेगाधातविदाहिभिः ॥  
 पृथक् सम्भूय वा दोषाः कुपिता गुल्मरूपणम् ।  
 घलमीकन्त्र मसुद्धमन्तः कुर्वन्ति विद्रधिम् ॥ १३  
 गुदे वस्तिसुखे नाभ्यां कुक्षी वडक्षग्योस्तथा ।  
 शृक्कयोः प्लोहि यकृति हृदये क्षोम्नि वा तथा ॥  
 तेषां लिङ्गानि जानीयाद्वाद्विद्रधिलक्षणात् ॥ १४  
 सुश्रुतसंहिता निदानस्थानम्, ६ ।

called *septicemia*; but if the purulent foci are developed as the abscesses in the liver, kidney, lungs, heart etc. which are known as metastatic abscesses, it is called *pyemia*. In the transitory stage of both these morbid processes, it is often called *septico-pyemia*. However septicemia and pyemia are both usually attended by fever, diarrhoea and other symptoms of malaise according to the virulence of the infection and the bodily reaction)". *Suśruta* II. 9. 20<sup>151</sup>.

"If any one neglects a suppurated abscess, it burrows through to an interior organ, and as it proceeds like a tube, it is called 'nādi-vrana' (*fistular abscess*)."  
*Suśruta* II. 10. 9<sup>152</sup>.

151. चीणामप्रजातानां प्रजातानां तथाऽहितैः ।  
 दाहज्वरकरो घोरो जायते रक्तविद्धिः ॥  
 सुश्रुतसंहिता, निदानस्थानम्, ६ ।

152. शोफं न पक्षमिति पक्षमुपेक्षते यो  
 यो वा व्रणं प्रचुरपूयमसाधुवृत्तः ।  
 आन्यन्तरं प्रविशति प्रविदार्थ्य तस्य  
 स्थानानि पूर्वविहितानि ततः स पूयः ॥  
 तस्यातिमात्रगमनाद्वितिरित्यतश्च  
 नाडीव यद्वहति तेन मता तु नाडी ॥ ६  
 सुश्रुतसंहिता, निदानस्थानम्, १० ।

"When a rounded and knotted swelling is developed by the corruption of the '*vāta, flesh, blood, serous fluid and the fat*', it is called '*granthi*' (*cyst*).

In the '*vāta-granthis* (*aneurism*)', pains are felt with the sensation that the cyst is being elongated by a gravitating force (expulsive pain), that it is being torn (terebrant p.), that it is being penetrated by needles (boring p.), as if dashed out (tensive p.), as if being lancinated (lancinating p.) or lacerated (lacerating pain); it is dark and shaped like the bladder, and if it bursts, pure blood comes out of it (*aneurism* is a blood-containing cyst formed by circumscribed enlargement of an artery through which the blood circulates. Such cysts are distinguished by their expansive pulsation with each systole of the heart, by a thrill to be felt on palpation and by a '*bruit*' heard on auscultation. As they increase in size, they produce absorption of adjacent structures and give rise to distressing pain by their pressure on nerves, and their final tendency is to burst, and if a large artery is the seat of the cyst, to cause death ).

In '*pitta-granthis*' (*hemangioma*), there is hyperemia, and the pain seems to be like that of the application of caustics and cautery: the

cyst is of reddish or dark-yellowish color, and if it bursts, very hot blood comes out (*hemangioma* is a blood swelling or cyst due to the dilatation of the blood vessels ).

*The 'Kapha granthis'* (*tubercles*) are cold, pale, slightly painful and are hard like stone, and take a long time for their growth (suppuration) ; when they burst, a thick whitish pus comes out of them ) ; *tubercles* are called cold abscesses or they arouse no local or general reaction. Tubercles appear under three different aspects ; gray granulation, Laenneck's tubercle and caseous mass. Gray granulation is a small, hard and non-nuclear nodule, surrounded by a reddish vascular zone and their dimensions vary from 0.5 millimeter to 2 or 3 millimeters. Laenneck's tubercle is more voluminous ; it is a round, gray or yellow mass, having the volume of a pea, a hazelnut or a walnut. The caseous masses are greenish-yellow deposits and look like Roquefort cheese. The tubercular abscess may also arise from the breaking down of a tubercular lymphatic vessel ).

*The 'Meda-granthi'* (*lipoma*) is bright, voluminous, slightly painful, but pruritic ; it grows with the adiposity of the body, and declines with its decrease ; if it bursts, fat like that of the

kernel of the sesame or like clarified butter comes out (*lipoma* is a tumor of the fatty tissue, and grows in the subcutaneous tissues, especially in parts subjected to pressure—the shoulders and the buttocks, the abdominal wall and the breast, though it may be present in tissues containing very little fat as the dura matter, submucous tissue of the intestine, as a single or multiple flattened, rounded or pendiculated growth. When large it is always lobulated. The yellowish tissue of the lobules is usually softer and more plastic than the ordinary fatty tissue ).

The '*Sirā-granthi*' (*cirsoid aneurism*) is developed by the derangement of '*vāyu*' in a weak person through wrestling which causes arterial distension, distortion or contortion and elevates them (the arterics) like lotus stems, and makes of them roundish tumors ; if these tumors are painful and temporary, they can be cured with difficulty, but if they are painless, permanent, voluminous or developed in the vital organs, they are incurable (*cirsoid aneurism* is a tumor-like collection of dilated and elongated arteries. In the majority of cases, aneurisms are due to weakening of the arterial walls by arteriosclerosis. If the latter is diffuse, the dilatation

is generally fusiform and irregular ; if circumscribed, the yielding is succular. Of the causes of the sclerotic changes, syphilis is the most important in producing aneurism. Prolonged high arterial tension as in laborious muscular work, cardiac hypertrophy, a great and sudden strain as in heavy lifting, violent coughing or straining may initiate the dilatation if, the coats are weakened by previous disease ).

At the maxillary, clavicular, axillary, humero-ulnar ( and radial, i. e. elbow ), scapulo-clavicular ( back-neck ), and hyoid-thyroid-cartilaginous ( front neck ) joints, due to the accumulation of fat, a solid and rounded tumor (*exostosis* or *osteoma*) or causes slightly painful fatty and serous inflammation ; if the tumor resembles the stone of myrobalan or the fish-roe, or any such similar substance and has the color of the skin, it is called '*apachi*' (*exostosis*) because of its swelling. Exostosis is pruritic and slightly painful ; some of them (*exostosises*) exudate when torn ( or incised ). It lasts for a long time, its nodules being destroyed and renewed. This disease develops from '*fat and kapha*' and is very hard to cure (*osteomas* and *osteomatoid* conditions, in which there is localized or general overgrowth of the bone, are of

common occurrence. Both groups are found chiefly at the point of junction of a bone and its cartilage, fasciæ, periosteum, tendons and the ligaments, in the pia matter and the dura matter in the choroid and sclerotic coats of the eye at the apex of the lungs, in the skin and the mucous membrane, and sometimes even in the penis and in muscular tissues. They are usually divided into two groups, the exostosis, or those growing from the surface of the bone, and enostoses or those growing within the bone. And again they may be divided according to their structure, into eburnated exostosis intensely hard like that of the cement of the tooth and spongy or cauliflower exostosis ).

Due to some lesion, the tissues become affected, and a rounded, solid neoplasm slightly painful, voluminous, and deep-seated but with slender base, grows without suppuration ; it is called *arvvuda* (*tumor, neoplasm or cancer*).

Due to contraction of the blood-vessels and the blood, owing to a papilliferous, slightly ulcerative and exudative meat-ball (*neoplasm*) is firm which, grows rapidly and causes incessant bleeding. This is called '*rakta-arvvuda*' (*papilloma*). Due to the complications (sequels) arising from the loss of blood, the papilloma

victim becomes anemic. It is an incurable disease (*papilloma* is any abnormal excrescence having a villous structure, but more properly a tumor of the skin or of the mucous membrane, either sessile or pedunculated, consisting of hypertrophied or new-formed papillæ, covered by an envelope of the epithelial cells separately on each papillæ, so as to produce a villous or filiform appearance. Papilloma is usually benign but if neglected, it may form the starting point or be converted into malignant '*epithelioma*'. Also a destructive papilloma is known which is probably a carcinomatous form, and which is ulcerative and in which the papillary growth upon the surface extends into and destroys the subjacent tissues.

If any part of the body is lacerated by a blow, there is developed a painless, bright, skin-colored, non-suppurative, stone-hard and fixed tumor, due to the lesion of the tissues ; and it is called *māmsa arvvuda*, (*myxoma* usually occur in submucous, subcutaneous or other connective tissues in the intermuscular septa between the bundles of nerves, in periosteum and in sub-serous fat, and has the general character of tumors of this group). If a myxoma victim partakes of meat, this tumor becomes thickened

and incurable. And of the benign-symptomatic tumors those which are infiltrative ( or malignant breast tumors ) are incurable.

Of the above-mentioned tumors those which are exudative or develop in the vital organs or in the vessels ( arterial, venous, lymphatic or nervous ) or those which do not move ( suppurate ? ) are incurable. If a new tumor develops on another, it is called ‘*adhyarrvuda*’ ( secondary or proliferation tumors that develop adjacent to each other as pairs are called ‘*dvirarvvuda*’ ( double tumors ). It is also incurable”.

“*Susruta* II. 11. 2-15.<sup>1+3</sup>

153. वातादयो मांसमस्कृ प्रदुष्टाः सन्दूष्य मेदश्च कफानुविद्म् ।  
 वृत्तोद्धतं विगचितन्तु शोथं कुर्वन्त्यतो ग्रन्थिरिति प्रदिष्टः ॥ १५३  
 आयम्यते व्यध्यते एति तोदं प्रत्यस्यते कृत्यते एति भेदम् ।  
 कृष्णोऽस्तुर्वस्तिरिवासतश्च भिजः ऋगेषानिलजोऽस्तमच्छम् ॥ ३  
 इन्द्रद्वाते धूप्यते चातिमात्रं पापस्यते प्रज्वलतीव चापि ।  
 रक्तः सपीतोऽव्यथवापि पित्ताद्विजः स्वेदुष्णामतीव चाचम् ॥ ४  
 शोतोऽविवरणैऽलपल्लजोऽतिकण्ठौः पापाणवत् संहननोपपत्तः ।  
 चिराभिवृद्धिश्च कफप्रकोपाद्विजः ऋगेषु कृष्णमन्व पूयम् ॥ ५  
 शरीरवृद्धिलायवृद्धिहानिः जिरधो महानलपल्लजोऽतिकण्ठौः ।  
 मेदः कृतो गच्छति चातिभिजे पिण्याकसर्पिः प्रतिमन्तु मेदः ॥ ६  
 व्यायामजातैरज्वलस्य तैस्तैराक्षिप्य वायुर्हि शिरप्रतानम् ।  
 संपीड्य सङ्कोच्य विगोच्य वापि ग्रन्थिं करोत्युद्धतमाणु शृणम् ॥

"A neoplasm or tumor is a new formation of tissue, which is atypical in structure, serves no useful purpose in the whole economy and the growth of which has no typical termination." According to Cohnheim there remains in the adult enough of unappropriated embryonic residues which if activated by any mechanical or microbic irritant outstrip the normal calculus growth and form a tumor possessing an unutilized and consequently an exaggerated power of proliferation. But the cells of the malignant neoplasms are themselves capable of starting new growths (*metastases*) if carried to

ग्रन्थिः शिराजः स तु कृच्छ्रसाध्यो भवेद्यदि स्यात् सर्वजश्चलश्च ।

आलक्ष स एवाप्यथलो महांश्च मम्मोत्थितश्चापि घिवर्जनीयः ॥ ७

हन्त्वस्थिकक्षाक्षकवाहुसन्धि-मन्यागलेषूपचितन्तु मेदः ।

ग्रन्थिं स्थिरं वृत्तमथायतं वा द्विरथं कफद्वालपलं करोति ॥ ८

तं ग्रन्थिभिश्चामलकास्थिमात्रै मर्त्स्याण्डजालप्रतिमैस्तथान्यैः ।

अनन्यवर्णैर्लक्षीयमानं व्यप्रकर्षदपर्वं वदन्ति ॥ ९

क्षाङ्गुयुतास्तेऽल्परुजः प्रभिक्षाः ऋवन्ति नरयन्ति भवन्ति चान्ये ।

मेदःकफाभ्यां खलु रोग एष सुदुस्तरो वर्षगणानुषन्धी ॥ १०

गात्रप्रदेशे क्वचिदेव दोषाः संमूर्च्छिता मांसमस्तु प्रदूष्य ।

वृत्तं स्थिरं मन्दरुजं महान्तमनल्पमूलं चिरवृद्धिपाकम् ॥

कुर्वन्ति मांसोपचयन्व शोफं तदनुर्द शाङ्कविदो वदन्ति ।

मुश्रुतसंहिता, निदानस्थानम्, ११ ।

distant parts by circulation, as a malignant tumor of the breast may start new cancers far removed from the original lesion into the lungs, ribs, brain and the abdomen through the lymphatic current. No microbic agent has yet been definitely identified with the tissues of the malignant tumor, though '*micrococcus neoforfans*' has been found in both benign and malignant neoplasms. However, the probability is that there is a specific pathogenic cancerous agent. Fortunately all neoplasms are not dangerous. The benign tumors are entirely harmless unless they are situated in a sensitive position, where by their growth they might cause pressure on the nerves or displace the vital organs. And they never reproduce themselves in distant parts by grafting like the malignant growths. And the fundamental difference between the two types, though the process of their growth has the same tendency of exaggerated, abnormal proliferation and multiplication of their own cells, lies in the fact that the benign tumor does not eat its way into the surrounding tissues, but remains closed in its own fibrous capsule. While a malignant tumor infiltrates into the neighboring tissues, causes destruction of the healthy cells, creates an ulcerative zone and therein transplants a new colony.

But only sarcoma, endothelioma and carcinoma are malignant. However, between benign adenoma and malignant epithelioma there exist numerous transitions, and under certain circumstances, a benign tumor may turn into the malignant type as '*destructive papilloma*'. And though tumors may be observed in all ages, yet their frequency and nature vary considerably at different periods of life. In the defective development of the embryo, angioma are frequently met. During early life sacromata are observed, located chiefly in the kidneys. At puberty exostoses are frequent. In women at a later period, ovarian cysts belonging to the group of adenomata and epitheliomata are encountered. From the age of fourteen onward, epithelioma becomes more and more common, reaching its maximum of frequency between the age of fifty and fifty-five years. Age exercises no less influence upon the localization than upon the nature of the tumors. In children, they affect, in order of frequency, the eye where melanotic sarcoma is met with, the kidney, testicles and spleen. In adults the part of the body most frequently attacked is the stomach, uterus, liver, mamma and the intestine in the order mentioned. It is certain that the irritation alone,

microbic or mechanical, is not sufficient to develop tumor unless the organism is predisposed to it by heredity, or has acquired this characteristic through some morbid process of pathogenesis which is not yet understood.

The abscess (*Vrana, furuncle*, boil or carbuncle, differs from the furuncle or the boil in various points. (1) It generally occurs singly and usually appears at the back of the neck, the back or the buttocks. (2) It is very large in size like a hen's egg or even larger. (3) It contains more than one core (necrotic tissue or suppuration points as in furuncle), due to (corruption) of the '*vāyu, pitta, kapha and the blood*', produces intense burning, throbbing, tremulous and pricking pain, hyperæmia, suppuration, redness, swelling and hyperesthesia; and it causes various kinds of pain and exudation." *Suśruta IV. I. 20<sup>151</sup>*.

"There are sixty treatments of '*vrana*' (suppurative tumor, especially furuncle) as follows: *fasting (apatarpana)* to facilitate the elimination of the toxic and the effete matter circulating in

154. निर्हननिर्मथनस्फुरणातोददाह पाक-राग-क्षय-स्वाप-वहुसो नाना-  
दूषेद्वाभावविशेषोपेतः पवनपित्तकफ्याद्योग्यितेभ्यः ॥ २०

the blood which predisposes the tissues to pyogenic infection), *epithem* (*ālepa*, to spread over the boil to relieve pain, congestion, to focalize the inflammation and to bring out suppuration), *lotion* (*pariṣeka*, to wash the inflamed part for asepsis and to relieve pain), *salve* (*abhyāṅga* to smear over as an antiseptic and analgesic), *fomentation* (*sveda*, as an analgesic and suppurantia), *emollient* (*vimlāpana*, to soften and beat the boil), *cataplasma* (*upanāha*, as a suppurantia), *suppurantia* (*pāchana*, to cause early suppuration), *leeching* (*visrāvana*, to apply sucking leeches to relieve congestion), *emulsion* (*sneha*, as a stimulating nourishment), *emetic* (*vamana*, to remove gastric irritants), *dissection* (*chhedana*, to remove the ulcerative parts of a non-suppurative tumor), *incision* (*vedana*=lancing to cause the drainage of the pus), *scari-fication* (*dāraṇa*, to soften the skin so as to cause spontaneous bursting of the abscess in the timid women and children who are afraid of lances and incision), *evacuation* (*lekhana*, to scratch and to wipe out the impacted caseous pus from the abscess cavity), *exploration* (*eṣaṇa* to find out the nature of the abscess cavity in a fistula), *extraction* (*āharana*, to extract any foreign body from an abscess), *puncture* (*vyadhana*,

exploratory puncture of a cavity or a tumor with a hollow needle to determine the presence or absence of fluid or gas, and its nature, if present), *suction* (*vidrāvāna*, to suck the liquid pus and exudation from an abscess cavity or serous fluid from hydrocele or ascites through a tube by exhausting the air in the front), *suture* (*sīvana*, to reunite by stitching a wide-gaping, non-suppurative wound with a silk-thread), *appositional reunion* (*sandhāna*, to put the wounded and operated parts in their proper place and to unite them together), *compressive epithem* (*pīḍana*, an epithem that draws the pus to the surface), *hemostatic* (*soniāsthāpana*, to arrest bleeding of a wound), *lenitive* (*nirvvāpaṇa*, to soothe and to relieve irritation), *medicinal fomentation* (*utkārikā*, to provoke suppuration), *antiseptic astringent* (*kaṣāyā*, to cleanse the wound-cavity), *collyrium* (*vartti*, as disinfectant), *mucilaginous paste* (*kalka*, as a disinfectant), *ointment* (*ghṛta*, as depurant), *oil* (*taila*, as depurant), *chemical action* [*rasa-kriyā*, of sesame decoction, thickened and made into paste with the mixture of iron sulphide (*surāṣṭrajāṁ sakāśīḍāṁ*), *arsenic disulphide* (*manahśilā*) and *arsenic trisulphide* (*haritāla*)] to be applied to the abscess—*Susruta IV. I. 59*], fine *bland*

*powder* (*avachūrnana*, as a deodorant), *fumigation* (*vṛana-dhūpana*, to expose the abscess cavity to medicinal gases), *vulnerary* (*ulsādana*, to promote healing and cicatrization), *inunction* (*avasādana*, to promote tissue formation and normal circulation in the cicatrized area), *emollient* (*mrdu-karma*, to soften the skin), *tissue-hardener* (*dāruṇa karma*, to harden the tissues with tannic astringents), *caustic* (*kṣāra-karma* destroy a long standing ulcer, which is hard to cure), *cautery* (*agni-karma*, to scar the ulcerated tissues which do not easily cure, especially in the bladder and the joints), *pigmentary* (*krṣṇa-karma*, to promote pigment cells in the pale cicatrised area), *pigmento-lysin* (*pāṇḍu-karma*, to destroy the pigment, in order to bleach the darkened area), *pigment-normalizer* (*pratisārana*, to normalise the skin-color of the affected area), *hair-grower* (*roma-sañjanana*, to promote the growth of hair, where the hair follicles have been destroyed), *depilatory* (*lomāpaharana*, to cause the falling out of hair where it is not desirable, or by shaving). *clyster* (*vasti-karma*, as an antiseptic injection in a deep-seated abscess), *irrigation* (*uttara-vasti*, to wash out the purulent deep-seated abscess cavity), *bandage* (*vanda*, to protect the wound from microbic infection),

*plaster* (*patra-dāna*, as a pepastic), *germicide* (*krmighna*, as a destructive agent of the microbes), *detoxinants* (*viṣaghna*), *stimulants* (*vṛmhana*, to activate the organism to fight against the disease, to throw off the toxins and to restore health) *sedatives* (*siro-virechana*, to remove congestion from the upper parts of the body, in case of abscesses there), *snuff* (*nasya*, as a sedative), *mouth-wash* (*kavalo-dhūrana*, as a disinfectant in stomatitis), *fumigation* (*dhūma*, exposure to the action of a disinfectant smoke), *analeptic* (*madhu-sarpi*, a restoration), *operation* (*yantra*, to operate where there is a foreign body in the wound and its mouth is narrow), *dietary* (*āhāra*, light and stimulating foods), and *hygiene* (*rakṣā-vidhāna*, as curative and preventive). “*Suśruta* IV. 1. 22. ; 59<sup>155</sup>.

१५५. तस्य व्रग्यास्य वष्टिरूपक्रमा भवन्ति । तद्यथा—अपतर्पणामालेपः परिषेकोऽभ्यङ्गः स्वेहो विम्लापनमुपनाहः पाचनं विश्वावणं स्नेहो वर्मनं विरेचनं क्वेदनं भेदनं दारणं लेखनमेयणामाहरणं व्यधनं विद्रावणं सीवनं सन्धानं पीडनं शोणितास्थापनं निव्वापणमुत्कारिका कथायो वर्त्तिः कल्पकः सर्पिस्तैलं रसक्रियावृद्धूर्णं व्याधूपनमुत्सादनमवसादनं मृदुकर्म्म दारणकर्म्म शारकर्म्माभिकर्म्म कृच्छाकर्म्म पाण्डुकर्म्म प्रतिसारणं रोमसञ्जननं सोमाप-हरणं वस्तिकर्म्मोत्तरवस्तिकर्म्म वन्धः पत्रदानं कृमिन्नं वृहणं विचाप्न-यिरोविरेचनं नस्यं कशलधारणं धूमो मधुसर्पिर्यन्त्रमाहारो रक्ताविधानम् इति ॥ २२ सुश्रुतसंहिता, विकित्सितस्थानम्, १ ।

"After the above-mentioned treatment, if the inflammation is found to be of a suppurative kind, then by the application of a pustulant, it has to be made to suppurate, then lanced and disinfected." *Susruta* IV. 16. 4<sup>156</sup>.

*Etiology* : Furuncle or boil is not possible without the infection of staphylococcus pyogenes aureus which is invariably found in the pus. This gives rise to acute inflammation and exudation, leading to necrosis of the tissue. The infection of the staphylococcus pyogenes aureus is favored by the impairment of the tissue vitality, which is the natural consequence if the blood contains toxic, irritant or effete matters. In that case, the tissues are not only ill-nourished, and therefore incapable to offer natural resistance to microbic invasion, but

व्रणानां स्थिरमांसानां कुर्व्यादुद्वैल्येति॒ते ।  
कवायैर्विधिष्ठ तेषां कृते व्यामिभयेत् पुनः ॥  
उराहूजां सकासीसां दयाकापि मलःशिशाम् ।  
हरितालम्ब मतिमांस्तस्तामवचारयेत् ॥ ५६  
सुभुद्रसंहिता, चिकित्सत्त्वानन्, १ ।

156. वेशवारैः सङ्ग्रहरैः पदोभिः पायंसेत्तथा ।

सेद्वेत सततकापि निर्झरेत्तथा पि ज्वैचितन् ॥ १

सुहुत्तुंहिता, चिकित्सत्त्वानन्, १५ ।

especially when the kidney fails to eliminate the effete and the toxic substances in the blood, the burden falls on the skin as an emunctory organ. This naturally irritates the skin and predisposes it to the infection of staphylococcus which is ubiquitous causing furuncles, boils and carbuncles. And they are usually associated with the diseases, especially if the renal functions have been impaired, as in chronic dyspepsia, gout, rheumatism, scrofula, tuberculosis, diabetes and albuminuria. It is frequently met with in dyspepsia in which there is insufficiency or deficiency of the pepsin and the trypsin, especially the latter, leading to albuminous putrefaction, whose toxic products are absorbed into the blood, and are thrown over to the skin for elimination when the kidney alone is not equal to the task.

Therefore special attention should be paid to dietary and cleanliness. Fresh, healthy, wholesome light and easily digestible food should be taken in restricted quantity, especially of the albumins. All irritant foods, drinks and spices must be avoided. Whey or butter-milk which by its lactic acid producing content (*lactose*) counteracts putrefaction by changing the culture medium of the proteolytic bacteria is a very

preferable addition to the diet, or an exclusive diet for a few days.

"A 'slesma' tumor which has not been remedied by any application, and which has not grown in any vital organ, should be dissected, extirpated, in its premature state, the wound cauterized and treated as any fresh wound. *Susruta IV. 18. 8<sup>157</sup>*.

"A tumor in its premature state ( that is, it should be operated as early as possible ) should be excised and cauterised. Or as according to the previous instruction, it should be scratched out, and the caustics should be applied to the wound. "*Susruta IV. 18. 16<sup>158</sup>*.

"If the neoplasm is not deep-rooted, then with a ( wire ) of tin ( *trapu* ), copper, lead or silk (cord) it should be surrounded, and carefully

157. अमर्जन्तारं इसमप्रजातसमपक्षमिवापहरेविदार्यः ।

दहित् स्थिते शास्त्रज्ञ सिंहकर्णा सद्यःचतोक्षव विधिं विदध्यात् ॥ ८ ॥

सुशुतसंहिता, चिकित्सास्थानम् , १८ ।

158. गन्धीनमर्जनप्रसवानपकाशुद्धूत्य चापि' विदधीत पक्षात् ।

चारिण वापि प्रतिसारयेत् तु दुलिल्लिख शस्त्रे च यथोपदेशम् ॥ १९ ॥

सुशुतसंहिता, चिकित्सास्थानम् , १८ ।

the physician should use the knife, caustic or cautery, according to the strength of the patient. *Susruta* IV. 18. 29<sup>158a</sup>.

"If any part of the neoplasm remains and is not completely extirpated, then from the remnant the neoplasm reappears, as fire can grow from a small spark left-over ; therefore all the growth ( of the neoplasm ) must be extirpated". *Susruta* IV. 18. 33<sup>159</sup>.

There is no question that the complete extirpation of either the benign or the malignant neoplasm is the best remedy, wherever possible, that is when they have not developed with a deep base in any vital organ.

## VII — Skin Disease.\*

*Prodromes of Leprosy* :—“The thickening of

158a. यदत्प्रसूलं वपुताब्धीस-पट्टैः समावेष्टा तदायसैर्वा ॥  
काराग्निश्चाण्डसहाद्विदध्यात् प्रणानिंस्त्रु भिवगप्रमत्तः ॥ १८  
सुश्रुतस्त्रिता, चिकित्सितस्थानम्, १८ ।

159. सशेषदोषाणि हि योऽनुदानि करोति तात्पात्रु पुनर्भवान् ।  
तथादशेषाणि समुद्धरेत् तु हत्युः सशेषाणि यथा हि वक्त्रः ॥ १९  
सुश्रुतस्त्रिता, चिकित्सितस्थानम्, १९ ।

\* The writer regrets that he lacks the clinical ex-

the skin, sudden horripilation, pruritus, hyperhidrosis or anhydrosis, anesthesia of the skin, the extension of ulceration if any wound takes place, and the dark color of the blood are the prodromes of 'Kuṣṭha' (leprosy)."*Susruta* II. 5. 2<sup>160</sup>.

"In the 'vāta' leprosy, the lepromes are browny and slender with boring pain and anesthesia; it is called 'aruna' - sun-colored 'lepra flava'. In the 'pitta' leprosy, the nodosities are like the

perience of skin disease, especially the tropical dermatosis, and the diseases of the genital organs. His knowledge is limited to the studies of authorities on these subjects. And moreover as the cutaneous manifestations are hard to identify without the associated symptoms, and both Charaka and Susruta have given vague description of them, only those diseases will be mentioned which have a direct bearing on the history of syphilis in ancient India. It is very likely that the papulo-squamous syphilitide, pustulo-crustaceous syphilitide, tubercular syphilitic dactylitis, exostoses, osteo-periostitis, nodes, gummata and ulcerations have been classified as leprous manifestations or varieties of leprosy.

160. तत्पूर्वस्यादि लक्ष्याद्यमकाशाद्विमहर्षः कस्यः सेदवाइत्यमसेदनं  
व्यषुप्रदेशान् शायः चतुर्विषयं चमचनः लक्षणं चेति ॥ १

[सुश्रुतसंहिता, निदानसारान्, ५.]

ripe fruit of '*ficus glomarata*' ; this is called '*audamvara*' leprosy (*lepra nodosities*, rounded, hemispherical, varying in size from a pin's head to a hazel-nut, hard and elastic to the touch, pale-red or brown in color, may appear from the beginning without any antecedent patches, scattered over the body, especially on the face, forehead, elbows, knees and legs). In the '*rasya-jihva*' leprosy, it (*the lepra erythematous patch*) has the size and the roughness of antelope's tongue. Black scales appear in '*kapāla*' (*scabby leprosy : psoriasis*). Black-red patches like those of the fruit of '*abrus precatorius*' appear in '*kākanaka*' (*lepra nigricans*, black in the centre and reddish at the edges as in the '*kākanaka*' fruit). Heat, tensive pain, hyperæmia and cloudy sensation (disturbances of the cutaneous nerves) are felt in these four kinds of leprosy. With microbes bullæ appear, burst and ulcerate.

'*Paundarika*' (*nodes*) are shaped like the lotus leaves ; '*dadru*' is copper-colored or like that of the flower of '*linum usitatosimum*' (dark) and the nodes continue to grow covered with herpes. The nodes of both '*paundarika* and *dadru*' are elevated, globular and pruritic and they take a long time for their growth. These are their general symptoms.

**Minor 'kuṣṭha' :** Hard, broad-based, thick and dry nodules develop at the joints in '*sthūlakuṣṭha*' (*dry leprosy*). There is contraction of the skin (the skin thickens by infiltration and forms deep sulci by folding on itself), boring pain and anesthesia in '*mahā-kuṣṭha*' (*anesthetic leprosy*). The disease in which the skin becomes dark-brown (bronzed) is called '*eka-kuṣṭha*' (Addison's disease); this is incurable. In '*charmadala-kuṣṭha*' (*tinea albigena*?) there are pruritus, tremor, tensive and burning pain in the palms of the hands and soles of the feet. The leprosy in which the skin, blood and the flesh become affected, and spread over the body, like erysipelas (*visarpa*), and which causes swooning, burning sensation, nervousness, prickling pain and ulceration, is called '*visarpa-kuṣṭha*' (*cutaneous leprosy*). The leprosy in which exudative bullæ repeatedly spread over the body is called '*parisarpa*' (*macular leprosy*). The skin lesion, in which there is pruritic, whitish, painless and scattered (*tanu=thin*) eruption in the upper part of the body, is called '*sidhma-kuṣṭha*'. The skin lesion in which very pruritic, painful and dry patches appear over the entire body, is called '*vicharchikā*'; if this very pruritic and painful manifestation appears only on the

foot, it is called 'vipādikā' (*psoriasis*). The skin lesion which is exudative, globular, superficial, very pruritic, shiny and dark, is called 'kitima' (*acne keloid*). If exudative, pruritic, inflammatory and tiny pustule appears over the entire body, it is called 'pāniū' (*eczema*). If the 'pānā' becomes suppurative, it is called 'kachchhu'. 'pyosis tropica'. Pruritic but non-exudative pustules that appear over the entire body, are called 'rakasū' (*dry eczema*). *Sygruta* II. 5. 7-10<sup>०१</sup>.

161. तत्र वासेनारुण्याभानि तगूनि विसदौषिण तीर्दभदस्वापयुक्ताच्चरुणानि । पित्तेन पकोऽन्वरफलाकृतिवर्णान्वीचुव्वराणि । नृथजिह्वाप्रकाशखरत्वानि नृथ-जिह्वानि । कृष्णकपालिकाप्रकाशानि कपालकुठानि । काकण्ठानकाफलसट्टशन्वतीव रक्तकृष्णानि काकण्ठानि । तेषां चतुर्थामयोषधेष्वर्पश्चिदाहृथमायनानि लिप्रोत्यान-प्रपाकभेदित्वानि क्रिमिजन्म च सामाच्चर्यानि लिङ्गानि ॥ ३

पुरुरीकपवप्रकाशानि पौखडोकाणि । अतसौपुष्पवर्णानि तामाणि वा विसदौषिण विष्फकावलि च दमुकुठानि । तयोर्द्योरप्युत्सवता परिमण्डिता काञ्च्छिरोत्यान-लच्छेति सामाच्चर्यपाणि ॥ ८

चुदकुठान्यत ऊर्हं वर्णयामः ॥ ९

स्थूलानि सम्बिलिदारुणानि रथ लाखषि स्युः कठिनाच्यहृषि ।

त्वचभिदस्यपनाङ्गासादाः कुष्ठे महत्पूर्व्युते भवन्ति ॥

लाखाच्च येन भवेच्छर्देरं तदेककुष्ठं प्रबद्धमायन् ।

स्थूर्येन कञ्च्च्यथनीषधोषासालीषु तवर्णदद्यं वदन्ति ॥

विसर्पं वस्तु सर्वतो यस्त्वयक्तमांसाच्चभिमूर्य शौक्रम् ।

सूर्याविदाङ्गारतितोदपावान् लक्ष्या विसर्पः स भवेषिकारः ॥

"When the microbes begin to eat up the skin etc., various symptoms appear according to the nature of the lesion. Due to 'vāta', ( *lepromas* ) become pale-white or sun-colored, rough and dry, and there are boring pain, emaciation, piercing pain, tremor, wrinkles of the skin, horripilation, lassitude, paralysis, anesthesia, gangrene and mutilations ( of extremities ). Due to 'pitta' the following symptoms manifest, as burning sensation, sweating, effusion, decomposition ( of the tissues ), exudation, ulceration and bloody color ( of the sores ). From 'ślesmā' the following symptoms manifest as chilliness, whiteness ( of the macular patches ), pruritus, hardness ( of the nodes ), heaviness, elevation ( of the nodes, thickening and folding of the skin ), fattiness ( fatty infiltration ) and ( ulcerous ) crusts.

अन्तः शरोरे पोङ्काः अवत्यः सर्पति यासं परिसर्पयन्तः ।

कष्ठून्तिं देतमपायि सिध्विद्यात् ततु प्रायश जर्हकाये ॥

रात्र्योदतिकष्ठूर्तिं देतः सुख्ता भवति गादेषु विचर्षिकायाम् ।

कष्ठूभूती दाहजोपपत्रा विपादिका पादगतियमेव ॥

यत् जावि हतं घनसुयक्ष्म्यूत् लिङ्घक्ष्म्यूतिं वदन्ति ।

साक्षादकष्ठूप्रिदाहविः पामाणुकाभिः पिङ्काभिहत्या ॥

स्फटैः सदाहैरति से व कष्ठूः किञ्चुपायिपादप्रभैर्निं बद्धा ।

कष्ठून्तिं या पिङ्का शरीरे संबाध्योग रक्तसोचते सा ॥ १०

परकष्ठूहिता, निदानस्त्राणम् ॥

"When the microbes eat up slowly the four ( layers ) of the skin ( epidermis, corium, muesum and corneum ), vessels and nerves ( *sirā* ), tendons and tender bones, then there are other complicating leprous symptoms as exudation, gangrene, deformations, polydipsia, fever, diarrhoea hyperæmia, debility, anorexia and indigestion, in which it becomes incurable". *Charaka II.* 5. 15-16<sup>1+2</sup>.

*Leprosy* is caused by Hansen's '*bacillus lepræ*' which morphologically has a very striking resemblance to the tubercular bacillus, but according to Jamanito, the tubercular bacillus is stained black by the silver nitrate method, while the '*bacillus lepræ*' remain transparent. However, a large percentage of the lepers are found either tubercular or syphilitic. And these three diseases are very alike in their evolution and it is very hard often to diagnose one from the other without differential diagnosis. The '*lepra bacilli*' are found in all diseased tissues, in nasal, salivary, vaginal and urethral secretions, tears,

162. क्रिमयस्तु लगादौशतुरः सिरास्थाय चास्थान्यपिच तरुणानि खादन्ति ।  
अस्थाच्च वावस्थायां कुषिणमुपद्रवाः स्पृशन्ति । तद्यथा प्रस्ववयमङ्गम्भेदः पतनान्यवृत्ता-  
क्यवाणां दृष्टाज्वरातिसारदाह-दीर्घल्यादोचकाविपाकाश तथाविधमसाध्यं विद्यादिति ।

चरकस'हिता, निदानस्थानम्, ५ ।

sputum, semen, macular scales, exudation or discharges from the sores. It seems that the lepra bacillus takes a long period for the evolution of leprosy and incubation is very slow lasting from 2 to 20 years. The lepra bacillus is infectious, but its contagion is not of a virulent type, as is demonstrated by the fact that usually the attendants at the leper asylums with cleanliness of the body, hygienic living and nutritious dietary, escape from this loathsome malady. On the other hand it is undeniable that the segregation of the lepers in Norway, Hawaii and the Philippine Islands have shown a very promising result, in not only arresting the spread of leprosy, but also tending to uproot the disease entirely as it has been done in Europe. However, the mode of its infection is not yet known. It seems the lepra germs find a favorable medium for growth, like tubercular bacilli, in an organism devitalized by malnutrition, uncleanness and unhygienic living. And that perhaps explains how with improved living and hygiene, it has practically died out of Europe. It is usually found in the East among the poorer classes who suffer from chronic malnutrition and live in unhygienic surroundings in the midst of filth and misery. The tissues therefore lack the resisting power against

the invasion of the '*lepra bacilli*' though they possess but feeble virulence.

There are three forms of leprosy : (1) '*tubercular leprosy*', (2) '*muculo-anesthetic leprosy*' and (3) '*mixed leprosy*'. In the tubercular form, there are repeated attacks of fever as a reaction of the organism against the invasion of the lepra bacilli. There may be pruritus and hyperesthesia of the skin with neuralgic pain in all locations. In most cases there is a premonitory eruption of vesicles or bullæ, affecting the extremities chiefly. These bullæ appear rapidly, are usually painless, break spontaneously, and often heal as ulcers, leaving behind a pigmented spot, brown, black, or white. Spots gradually make thus their appearance in various parts of the body, and the macular eruption is more frequent as the disease progresses. This may continue for months or years according to the resisting power of the organism. The small tubercles appear, grow in size and become confluent. They may simply ulcerate, without marked destruction of tissue, leaving small superficial ulcers, covered with greenish or brown crusts, destroying by degrees the adjacent tissues, tendons, ligaments, and finally the bones. If treated, they cicatrize and produce deformities; but if

neglected, they suppurate, and cause amyloidosis or gangrene. Almost from the beginning the senses are disturbed.

In the maculo-anesthetic or tropho-neurotic form of leprosy, the infiltration principally takes place into the nerves, causing their gradual irritation, inflammation, degeneration and destruction. In the first inflammatory stage, there is hyperesthesia, sensory, vaso-motor and motor disturbances manifested by burning numbness, formication (*sensory*), flushings of the face, glossy skin (*vaso-motor*), twitchings of the muscles (motor) particularly of the face, paroxysms of neuralgic pain and cutaneous manifestation. This is gradually succeeded by a period of nerve degeneration, marked clinically by anesthesia, paralysis, atrophies and distinct trophic disturbances. With the anesthesia, there appears a muscle-atrophy which first of all attacks the muscles of the hand (causing contraction), the extensors and flexors of the forearm, causing the characteristic '*claw-hand*'. There is loss of power, sense of touch, of heat and cold, even of pain. The muscles of the feet are likewise affected. There is a variety of trophic disturbances at this stage —shedding of the nails, loss of pigment, loss of

hair, loss of teeth, ulceration, followed by dry gangrene, necrosis and absorption of the bone with the resultant mutilation.

The 'mixed' is really the typical form of leprosy, combining the tubercular and tropho-neurotic manifestations, and the symptoms of both types are present. Of course lepra bacillus is found in all cases in all leprous lesions, whether located in the skin, mucous membranes, nerves or internal organs. Malnutrition, uncleanliness, infections of tuberculosis or syphilis which are found among a large percentage of the lepers, not only predispose the organism to leprosy, but also accelerate the progress of this malignant disease and hasten death.

*Treatment* :—“For a pious leper who wishes to live and for whom the five methods of treatment have not been effective, the wise physician should treat him in the following manner :—Ripe fruits should be collected, in the rainy season of the ‘tubara’ (*Faractogenos Kurzii: chaulmugra*) tree which grows on the southern sea-coast (*Arakan*) and whose branches are agitated by the wind, raised by the ocean waves ; the kernel of the fruits is to be taken out, dried and made into fragments. And then they should be pressed in a mill like

the sesame-oil press, or the oil extracted in a basin as with the saffron flower (*crocus sativus*). This should be put on fire (in a kettle) and when all the water has been evaporated from the oil, it ought to be taken out and placed (in a flask) in dried cow-dung for a fortnight. When the patient has been fattened by the treatment of oils, sweated by diaphoretics, cleansed (internally) by purgatives and emetics, then in a lunar auspicious evening, he should drink the oil, consecrated with the hymn that the essence of the kernel is the antidote of all poisons, etc. The 'tubara' (*chaulmugra*) oil causes repeated evacuations of the toxin (of the leprous lesion) through the upper and lower channels (*chaulmugra oil* is very irritant, and causes vomiting and purgation. It should be given in a capsule, or better still, to be effective, ethyl ester preparations of the fatty acids of the '*chaulmugra oil*' can be administered intramuscularly with the hypodermic syringe with marvellous results). After this cold barley water should be drunk without any salt (which provokes vomiting) and fat (which stimulates peristalsis). Thus he shall drink for five days the oil, and for a fortnight giving up all injurious habits as anger etc., shall live on rice and

the broth of 'mudga' (phaseolus mungo, both of them are constipative). If thus for five days the patient drinks the oil, he gets cured of all kinds of leprosy. If this 'tubara' oil is cooked together as before with three times the quantity of the decoction of *khadira* (*Mimosa ferruginacæ*) and he untiringly drinks it for a month, all leprema become destroyed, with the inunction and imbibition of the oil, together with proper dietary, and hoarseness of voice, red-eyes and ulcers eaten by bacteria are cured soon." *Susruta* IV. 13. 8-9<sup>1+3</sup>.

163. पञ्चकर्णगुणातीतं शब्दावनं जिजीविषुम् ।  
 योगेनानेन मतिमान् साधयेस् कुष्ठिग नरम् ॥  
 हृष्टास्तुवरका ये स्युः पश्यमार्प वभूमिषु ।  
 वीचीतरङ्गविक्षेप-मालतोऽतपङ्गवाः ॥  
 तेषां फलानि गट्टोद्यात् सुपकाव्यज्ञुदागमे ।  
 मम्ब तेभ्योद्धुपि संहृत्य शोषयित्वा विचूर्ष्य च ॥  
 तिलवत् पोषयेद्दोष्यां खावयेदा कुसुमवत् ।  
 तस्मै संहृतं भूयः पर्वेदा तोयसंक्षयात् ॥  
 अवतार्य करोति च पञ्चमावं निधापयेत् ।  
 विनष्टः स्त्रिदो छतसचः पञ्चाद्वृष्टं प्रयत्नान् ।  
 चतुर्थमङ्गान्तरितः शुक्रादौ दिवसे गुमि ॥ ८  
 मन्त्रपूतस्त्रैषस्य पिविनावां यथावत्वम् ।  
 तत्र मन्त्रं प्रवश्यानि येनेदमभिमन्त्रयते ॥

"If one eats the kernel of the 'tubara' fruit, his body becomes cleansed of all impurities ; it is very potent, and is the best medicine for leprosy." *Suśruta* IV. 13. 10<sup>164</sup>.

*Tubara* or *chaulmugra* (*Taraktogenos kurzii*), by which name it is better known, is certainly the best medicine known yet in the treatment of leprosy. A few intramuscular injections of the ethyl esters or intravenous in-

मज्जमार महावीर्यं सर्वान् धातृन् विशेषयः ।  
शङ्खचक्रगदापाणिस्त्रामाशापयतेऽच्युतः ॥  
तेनास्तोर्द्दमधशापि दोषा यान्त्यसङ्गत् ततः ।  
अस्त्रेहलवणां साथं यदागं शीतलां पिवेत् ॥  
पञ्चाहं प्रपिवेत् तैलमनेन श्रिविना नरः ।  
पच्चं परिइरेकापि मुहूर्य शोदनाशनः ।  
पञ्चभिट्ठिं वसैरेवं सर्वकुष्ठेविमुच्यते ॥ ६  
तदेव खुदिरक्षाये विशुणे साधु साधितम् ।  
निहृत्ति पूर्ववत् पक्कं पिवेन्मासमृतच्छ्रितः ॥  
तेनाभ्यक्तयरोरेष कुर्वीताहारमीरितम् ।  
भिन्नस्वरं रक्तनेत्रं विशीर्णं श्रिमिभवितम् ॥  
अनेनाशु प्रयोगेण साधयेत् कुष्ठिनं नरम् ।  
सुमुतसंहिता, चिकित्सितस्थानम्, १२ ।

164. शोधयन्ति नरं पीता मज्जानस्तथा मावदा ।  
महावीर्यमृतवरकः कुष्ठमीहोपहः परः ॥ १०

सुमुतसंहिता, चिकित्सितस्थानम्, १२ ।

jection of the salts—chaulmoogric and hydnocarpic acids, result in the destruction of the lepra bacilli in the tissues, followed by the disappearance of the nodules and healing of the ulcers. The oral administration of the chaulmugra oil is not so successful, for the reason that it is nauseating and offensive to the stomach, and when injected intramuscularly, it is extremely painful and very slowly absorbed. Its fatty acids—chaulmoogric acid and hydnocarpic acid, being solids, are unsuited for hypodermic administration. But the ethyl esters of these acids, being thin fluid oils, are well suited for injection and are well absorbed. And they have given remarkable result within a short time. These ethyl ester derivatives have been in use at the United States Public Health Service leprosy investigation station at Kalihi in the Hawaiian Islands only for three years with a very limited supply of the oil, and within this short period 140 lepers have been paroled and returned to their families, the disease apparently arrested, if not totally cured. From the joint report of J. T. McDonald of the leprosy investigation, and A. L. Dean, President of the University of Hawaii, the following conclusion may be summarized : (1) The intramuscular

injection of the ethyl esters of the fatty acids of the chaulmoogra oil usually leads to rapid improvement in the clinical symptoms of leprosy. In many cases the lesions disappear, except for scars and permanent injuries, and the leprosy bacillus can no longer be demonstrated. (2) When combined with iodine, the fatty acids of chaulmoogra oil and their esters give good result, but there is no adequate experimental proof that it causes any increase in the effectiveness of the materials used. (3) Although conclusive evidence is not at hand, it is probable that the oral administration of chaulmoogra oil derivatives is of minor importance compared with the injections. (4) In treating leprosy, it is important to make use of all auxiliary agencies to build up and maintain bodily vigor. (5) It has been sufficiently established that the chaulmoogra oil contains one or more agents which exert a marked therapeutic action in leprosy. We can not as yet say the disease is cured, since we have no test adequate to establish such a verdict. Whether or not the apparent cures are real and permanent, it is evident that we have a valuable agent at our disposal for the control of the disease.

In Burma and Assam, four varieties of

Chaulmogra trees (*Hydnocarpus castana*, *Hydnocarpus anthelmintica* in Siam where it is known as *Maikrabao* tree, *Gynocardia odoratissima* and *Taraktogenos kurzii*, spoken of by the Burmese as 'kalaw') are seen together, and they can not be easily distinguished one from the other without accurate botanical description. The trees, leaves, fruits and the oils are very similar. Only the genuine chaulmoogra *Taraktogenos kurzii* lacks the double testa on the fruit of the other varieties, and the oil derivatives of the '*Taraktogenos kurzii*' have the potent therapeutic value. Others only possess it to a lesser extent.\*

### VIII. Diseases of the Genital Organs.

"*Vrddhi (oscheoneous)* is the vascular swelling of the sac (scrotum) containing the testes, due to various lesions. Pain in the bladder, groin, testes and the penis are its prodromal symptoms.

The scrotum is distended and rough like a bladder filled with gas, and without any apparent cause there is pain due to the gas, in

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\* The vivid description of the Chaulmoogra tree is given with illustrations in the March content of the *National Geographic Magazine*, Washington, 1922, by J. F. Rock who was sent by the U. S. A. Department of Agriculture to secure the seeds of Chaulmoogra.

*vāta-vrddhi* (*emphysema*) may be classified under two divisions : (1) benign, where the gas is introduced into the tissues through a local wound or where its source is from some distant wound which communicates with the air-passages or bowels ; and (2) malignant, where gas is generated in connection with bacterial fermentation. The benign form gets well spontaneously. For the malignant form, incision, drainage and thorough disinfection are necessary).

The scrotum has the color of the ripe fruit of '*ficus glomerata*' and it (inflammation) grows and suppurates rapidly, in '*pitta-vrddhi*' (*epididymo-orchitis*) in which the symptoms somewhat differ according to whether the epididymis or the testis is more affected. On the whole the symptoms are more severe with the latter than with the former, though suppuration is more frequent in epididymitis. Premonitory symptoms are fever, headache and general malaise, followed by tenderness and pain in the affected parts. This disease might arise from the extension of the chronic gonorrhreal inflammatory process or secondary manifestation of syphilis in interstitial or gummatous forms. The patient must be put to bed and have the scrotum raised and supported with a pillow and ice-bag. The bowels

are to be opened with a purgative to remove internal congestion and light liquid food should be given as milk. After the inflammation has subsided, hot lead-lotion dressings or hot fomentations can be used advantageously to increase the vascularity of the part, thus aiding in the removal and absorption of the inflammatory products. If suppuration takes place, the abscess must be incised, drained off and the abscess cavity disinfected. If the lesion is of syphilitic origin, antisyphilic treatment is very beneficial ).

It is tense, slightly painful, cold and pruritic in 'slesma-vrddhi' (*edema* is common as the scrotum being elastic and distensible, is especially liable to be invaded by general dropsical effusions ).

The scrotum encloses a dark tumor and has all the symptoms of epididymo-orchitis in 'rakta-vrddhi' (*hematocele* which is a tumor caused by collection of blood in the cavity of the tunica vaginalis. It differs from hydrocele in that it is not transparent. It is usually associated with some traumatism, and is accompanied by inflammatory symptoms. Any variety of hydrocele or spermatocele may rapidly refill with blood, after being tapped, thus forming hematocele or by filaria. Hemorrhage also may take place into

the loose tissues about the cord, forming a tumor, sometimes called, diffused hematocele of the cord. For treatment, the sac should be incised antiseptically, the clot removed, the cavity irrigated, and drainage established and continued until such time as the obliteration of the sac by granulations has been accomplished ).

It is boggy, glistening, pruritic, slightly painful and looks like the fruit of the palmyra tree (*Borassus flabelliformis*) in '*medo-vrddhi*' (*elephantiasis*, the Scrotum is a favorite seat of this affection. The growth is slow, painless and progressive and may reach the weight of 150 pounds or more, and is caused by the blocking of the afferent lymph ducts by the adult worms and the eggs of *Filaria bancrofti*. The disease is confined to high temperature region and the egg of the *Filaria bancrofti* is introduced into the body by the bite of the mosquito, belonging to different species which are known to be its carrier as *Culex fatigans*, *Mansonia uniformis*, *Mansonia pseudotitillans*, *Pyretophorus costalis*, *Myzomia rossii*, *Myzorhynchus nigerimus*, *Cellia albimana*. The only effective treatment of the disease is operative removal which is very easy and successful, if special attention is paid to antisepsis, so that there can be no

septic absorption from the stump. To keep the skin clean and aseptic, and to choose the parts of the skin as flaps are rather important factors of a successful operation. The pedicle is clamped and the scrotal tissue removed, care being taken to leave the testicles and penis and ligaturing the vessels as they are exposed. The exposed testicles become covered by granulation and cicatrization).

Due to the retention of urine, the scrotum palpitates like a leather-bag filled with water; it is boggy and in this disease, there are strangury, pain in the testes and edema of the scrotum; it is called '*mūtra-vrddhi*' [urinary extravasation or *hydrocele*, possibly the latter. Urinary extravasation invades the scrotal tissues, causing a tumefaction as in simple edema (*slesma-vrddhi* hydrosscheocele). The urine however excites greater irritation than serous effusion, and consequently the scrotal tissues speedily become infiltrated by inflammatory exudates. If it be not relieved with a puncture-needle, trocar or incision, it usually results in abscess formation. Vaginal hydrocele on the other hand, consists of a collection of fluid, more or less serous, in the cavity of the tunica vaginalis. Perhaps by '*slesma-vrddhi*' (osche-

dema) hydrocele was meant. But according to the tradition, 'mūtra-vrddhi' is taken for hydrocele. The etiology of vaginal hydrocele is yet obscure. In the tertiary stage of syphilis, there is diffuse gummatous infiltration or the formation of localized gumma in the testes accompanied usually by a small hydrocele. In infancy the hydrocele is generally connected with gastro-intestinal fermentation ; in childhood and early adult life, it is very often associated with some abnormal condition of the testicle or spermatic cord ; later in life it is perhaps concerned with the vascular changes that take place with the degenerative involution of the testes]. "Susruta II. 12. 2-5<sup>165</sup>.

165. वातपित्रग्नेशशोणितमंदामूदालनिमित्ताः सप्त इत्यः । तासां मूदाल-  
निमित्ते इहा वातसमुत्त्वे कैवलयन् तपति हेतुरन्तमः ॥ २

अधःप्रकुपितोऽन्यतमो हि दं पः फलकोषवाहिष्ठरभिप्रयद धमनोः फलकोषयोर्बूङ्गं  
अनयति, तां इहिमित्याचचने ॥ ३

तासां भविष्यतीनां पूर्वस्थापाणि वक्षिकटेमुक्तमेटेषु वेदना मारुतनियहः फल-  
कोषशोफस्येति ॥ ४

तदानिलपरिपूरणो वांस्तमिवातां पश्चात्निमित्तां निवारणं वातहिमाचक्षते ।  
पक्षोऽस्त्ररससादां ज्वरदाहोऽधितःखाय समुत्त्वानपाकां पित्रहिम् । कठिनाल्प-  
वेदना शोता करुङ्ग मर्ती ये अड़ज्ञम् । हृष्टस्कोटाहतां पित्रहिमित्तां रक्तहिम् ।  
मृदुविष्णवां करुङ्ग मर्तं भृत्यवेदनां तालफलप्रकाशां मेदोहिम् । मूदवस्त्रारणशीलस्स  
मूदहिमित्तवति, सा गच्छतोऽस्तुपूरणो हतिरिव चम्भिर्मूदकर्क्षं वेदनां हृषण्योः चयथं  
कोषयोसापादयति, तां मूदहिमित्तविद्यात् ॥ ५

सुश्रुतस्त्रहिता, निदानस्थानम्, १२ ।

**Treatment :** "In 'vāta-vrddhi' (*emphysema*) apply soothing salve and plasterum (*anilā-pahāna* = relief of 'vāyu' = soothing) ; in case it is of a suppurative type (malignant emphysema), use a pustulant and after it has suppurated, incise (and drain) it without hurting the raphe, and treat it according to the prescribed rules in these cases.

In 'pitta-vrddhi' (*epididymo-orchitis*), the treatment of aneurism is beneficial ; if it suppurates, incise it and disinfect it with (antisep-tic) ointment (*kṣaudra-sarpī* = honied fat) and then apply vulnerary oil and mucilaginous paste.

In 'rakta-vrddhi' (*hematocele*), apply leeches for withdrawal of blood, or give as a sedative (diuretic) honey and sugar ; in suppurative or non suppurative form, hematocele should be attended to.

In 'slesma-vrddhi' (*hydroscheocele or vaginal hydrocele*), apply plasterum of calorific substances as (cow) dung and urine, drink the infusion of *Circuma aromatica* (or *pinus longifolia*) mixed with urine ; except compression, all other treatments of 'slesma-granthi' are beneficial. If it suppurates, incise it, and as a vulnerary of the wound, the restorative oil

concocted with Tritico estivo, Semicarpo anacardia, Alangio hexapetalo and Echite scholari, should be applied.

In '*medovrddhi*' (*elephantiasis*), use an emplasterum of a gum-resinous substance as myrrha or any other sedative, warmed with cow's urine to soften the scrotum, and when it is done, it should be bandaged (as antisepsis). Then with encouraging words to the patient, it should be incised with a leaf-shaped instrument, sparing the testes and the raphe, and all the fats removed (*Filaria bancrofti* and the larva which block the lymph-channels and cause the inflammation of the scrotal tissue), then green vitriol (*kāsīsa*=sulphate of iron) and rock salt (as disinfectant) should be applied and the wound sutured properly. As vulnerary, oil cooked with arsenic disulphide, arsenic sulphide, sodium chloride and semicarpus anacarda is to be applied.

In '*mūtrā-vrddhi*' (*urinary extravasation or vaginal hydrocele*), fomentation should be applied to the scrotum (to make it tense) and then have it bandaged (as antisepsis). By the raphe downward, an instrument like the sharp point of a grain (trocár) should be introduced, and thereby a double-barrelled cannula.

( through the one cannula air is passed to cause pressure so that through the other the fluid content may be completely drained off ), the urine ( fluid ) is evacuated. Then the cannula is to be withdrawn and ligature applied. If the wound remains clean (non-suppurated or granulated ), the vulnerary is to be applied. (The only difference in the modern method of tapping in hydrocele, is that after the fluid is evacuated, the cannula is not withdrawn usually, but a syringe which fits it, is filled with half a drachm of a solution of ten parts of carbolic acid to one of glycerine, and is injected into the cavity. This causes but slight pain. However the sac refills partially due to the inflammatory reaction caused by the carbolic acid, but the inflammatory exudate is gradually reabsorbed after the inflammatory process giving rise to it has subsided. However, tapping is but a palliative measure. It has to be done once or twice a year. But perhaps because it causes so little inconvenience and discomfort, it is preferred to operation by excision of a portion of the sac especially in old hydroceles with thickened walls due to sclerous and calcerous changes in the subserous tissues, which gives a more satisfactory result. However, whether in tapping or in operation, care has to

be taken to avoid wounding the testes or scrotal vessels ). *Susruta* IV. 19. 3-8<sup>166</sup>.

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166.

सिंहापनाही कुर्याच प्रदिष्टावानिलापहात् ॥  
 विद्युता पात्रयिला वा सिवनीं परिवर्जयेत् ।  
 भिन्नात् ततः प्रभिन्नायां यथोक्तं क्रममापरेत् ॥ ७  
 पित्तायामपकायां पित्तयन्त्रिकमो हितः ।  
 पक्षा वा भेदवेहिङ्गां शोधयेद् शौद्धसर्पिंषा ।  
 यज्ञायाच भिषग्दद्यात् तेलं कल्पाच रोपणम् ॥ ४  
 रक्तायां जलीकामिः शोणितं निर्वेद्यमिष्क ।  
 पिवेहिरेचनं चापि शर्कराचौद्दसं त्रुतम् ।  
 पित्तयन्त्रिकानं कुर्यादामि पक्षे च सर्वदा ॥ ५  
 उहिं कफात्मिकामुर्ज्वर्म् विष्टैः प्रश्नपयेत् ।  
 पोतदाहकवायस्य पिवेष्ट्रूदेष्व संयुतम् ॥  
 विकापनाहसि चापि उपयन्त्रिकामो हितः ॥  
 पक्षायाच विभिन्नायां तैलं शोधनमिष्टते ।  
 सुमनारक्षराष्ट्रोट-सप्तपर्णेतु साधितम् ॥ ६  
 भेदः समुत्ता संस्कृता लिपयेत् सुरसादिना ।  
 शिरोविरेकद्रव्यैर्वां सुखोर्ज्वर्म् वस्त्रयुतैः ॥  
 सिद्धाचावेष्य पट्टे न समाचास्य तु मानवम् ।  
 रक्षेत् फले सिवनीच्च हत्तिपवेण दारयेत् ॥  
 भेदसतः समुत्तृत्य दद्यात् कासोससैः अवे ।  
 वज्रीयाच यथोद्दिष्टं शुद्धे तैलाच दापयेत् ॥  
 भनः शिलालक्षवर्णैः सिद्धमारकरेतु च ॥ ७  
 सूक्ष्मां स्त्रेऽपिला तु यस्यपट्टे न वेष्टयेत् ।  
 सिवन्नाः प्रार्दद्वौ भक्षाहिष्ये द्वीपिमुखैः च ॥

"Carriage of a heavy burden, wrestling with a strong man, fall from a tree—all these strains increase 'vāyu' which enlarges the viscera and which in its downward course makes a tumor-like formation in the groin (*inguinal hernia*). If it be not attended to, it descends to the scrotum (*osceocele*) and causes the inflammation of the testes. This causes the distension of the scrotum like that of the bladder, and if it be pressed, gas ascends with noise, but descends again when left. This is called 'antra-vyddhi' (*inguinal hernia*). It is an incurable disease. "Suśruta II, 12. 6<sup>147</sup>.

"The hernia that has reached the groin, to

अथाद इमुङ्गा नाडों दस्ता विकावयेऽभिषक् ।  
 मूर्खं नाडीनषोडृत्य शृगिकावन्धमाचरेत् ॥  
 गुह्याद्य रोपणं दद्यादर्घ्य यदन्वितुकीम् ॥ ८  
 सुहृतस्त्रिहिता, विकितस्त्रितस्त्रागम, ११ ।

167. भारहरयवलविद्यह-हच्छपतन-दिभिरायाहविशेषे वायुरतिप्रहृष्टः प्रकृ-  
 यितस्य रूपाकारस्ते तरस्य च वार्द्धं हिगुच्छमादायाधो गला वहृष्यत्विन्दुपीत्व यन्त्रित्वपीत्व  
 स्त्रिलोपा प्रतिलिपिमादि च वालाकारित्व कलाकोर्वं प्रविष्ट्व न अस्त्रीफलापाद्यव्याप्तात्तिते  
 वक्तिरित्वात्तः प्रदीर्घे शोपी भवति सज्जनमवपीडितयोऽहम् द्युतिः विन्दुपीत्व पुनराध-  
 यति, तामन्त्रिहितमलाभामित्वाभ्युपत्ते ॥ ६

सुहृतस्त्रिहिता, विदावस्त्रागम, ११ ।

obstruct its passage, should be cauterized by a semilunar-shaped cautery. *Susruta* IV. 19. 10<sup>1\*\*</sup>.

*Hernia* is the protrusion of the abdominal viscera through weak spots in the abdominal wall, which develop either due to congenital deficiency of muscular or tendonous development or due to their degenerative changes. It is met with in two extremes of life. In infancy when the inguinal rings are as yet imperfectly formed, uncontrolled crying, coughing or any other form of severe strain may subject the tissues to give way. In old age tissues begin to degenerate, while the weight of the viscera is heavier, and under severe straining as in asthmatic paroxysm, the weak spots in the parietes are easily apt to yield.

"If the prepuce has been forcibly drawn back (over the glans, and its return is prevented by the arrest of the narrow opening behind the corona), during coitus with narrow vagina, masturbation, accident, play or detumescence, it is called '*avapātikā*' (*paraphimosis*; if this condition is left unrelieved, the circulation in the parts beyond may be interfered with sufficiently to

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तव या वहस्ता तो ददेदर्म्मवस्ताया ।

समझार्गापरोधार्थे कोपप्राप्तानु वर्जयेत् ।

मुहुरत्प्रिता, चिकित्सितकाल, २१ ।

make them swell, as to render retraction very difficult even when the preputial orifice is not very tight ).

In '*niruddha-prakasa*' (*phimosis*) the prepuce adheres to the glans penis, and therefore also contracts the meatus. But if it be not complete, the urine flows drop by drop with pain, ballooning the prepuce but without rupturing the glans penis. ( The best remedy of phimosis is circumcision with lateral incision as the dilatation of the preputial opening by any method is only a half measure, involving as much pain as cutting or operating. Phimosis should be corrected as early as possible, as the abdominal pressure exerted in the straining to evacuate the urine and in the crying which often accompanies the effort in such children, is sufficient to prevent the firm closure of the natural hernial openings and to cause yielding of those which have already closed. Another consequence of the mechanical obstruction is the obstacle which it offers to cleanliness, resulting in a balano-posthitis induced by the retention of the smegma which consists of the secretion of the glands of the lining membrane of the prepuce together with the dead epithelial cells from those surfaces, the decomposition of which is hastened by the

admixture of urine. This inflammation reacts on the nervous system and causes its irritability which is expressed in the peevishness of the child, and urinary disturbances such as frequent micturition, involuntary micturition especially at night, and spasmodic and painful micturition. The acrid and irritable decomposition product also provokes priapism in children and for the relief of this they learn and gradually habituate themselves to the pernicious practice of masturbation. In the adult the sexual erethism causes self-abuse, venery, spermatorrhea, premature ejaculation, backache and their various reactions. Circumcision is a great hygienic measure, especially in a tropical country ). *Susruta* II. 13. 40-41<sup>169</sup>.

169. अल्पायःखां यदा हर्षादालां गच्छेत् स्थिरं नरः ।  
 इत्सामिचातादथ वा चर्मस्युद्धिति चकातः ॥  
 महीनात् पौष्ट्राहापि शुक्रवेगविचाततः ।  
 यश्वावपाव्यते चर्मं तां विद्याद्वपाटिकाम् ॥ ५०  
 शतोपस्तमेवनु चर्मं संशयते मस्तिष्ठ ।  
 मणियम्बोपमद्वस्तु मूढं क्षीतो रुचिः च ॥  
 निदज्जप्रकाशे तदिनः मन्दधारमवेदनम् ।  
 मूढं प्रवर्तते अन्नोर्मणिर्ण च विदोर्यते ॥  
 निदज्जप्रकाशं विद्यात् सदग्नं वातसम्बद्धम् ॥ ५१  
 सुहृत्वःहिता, पिङ्गालसामन्तम्, ४३ :

"Application of 'śūka' for the enlargement of the penis, causes eighteen kinds of diseases.  
*Suśruta* II. 14. 2<sup>170</sup>.

Traditionally 'śūka' is taken as a pruritic water insect and used externally as an aphrodisiac. As 'śūka' is used in the plural, it is possible that it includes some species of the insects, belonging to the 'Coleoptera' order as 'Lyttta' or 'Cantharus corulea' (blue blistering fly of Bengal) or 'Lyttta nepalensis' (Nepal blistering fly, a black species having filiform antennæ and elytra broadened toward the apex), having its active irritating principle '*cantharidin*' and which is used as an aphrodisiac. When dried powder or its active principle is applied to the skin, it causes burning sensation and hyperemia, to which in the course of a few hours, succeeds the formation of vesicles. If the application is continued, it forms a blister, and if it goes on like that for a long time, sloughing and ulcerating result. If it is applied to the penis, it causes a voluminous swelling and engorgement of corpus cavernosum, and violent erection.

170. लिङ्गाद्विनिष्ठतामकमप्रवृत्तानां शुक्रदोषनिमिता दथ चार्दी च व्याख्यो वाचने ।

सुश्रुतस्य हिता, विद्याग्रस्थानम्, १४ ॥

"Due to the undue application of '*sūka*', vesicles develop like the mustard seed, and are called '*sarṣapikā*' (*cantharidal vesicles*).

Due to the application of poisonous '*sūka*', a stone-hard unsymmetrical tumor develops which is called '*asthilikā*', *ostcomu* or *chondroma* of the penis : ossification and calcification of the penis have been reported in many cases. The parts involved are the sheaths of the corpora cavernosa and the septum pectiniform. Ossification which is partial takes place usually in the plates very insidiously and without pain, and the patient first becomes aware of its existence by the impediment it offers to coitus or the curvature which it causes to the organ. Tuffier reports a case in which he found a bean-sized chondroma growing on the external surface of one of the corpora cavernosa, near the middle of the organ and which he removed by operation).

If the penis is repeatedly engorged by the '*sūka*', the vesicles that are developed like neoplasm, are called '*grathita*' (*soft vegetations* of succulent warts of the mucous membranes and muco-cutaneous junctions, especially found in the coronal sulcus and near frenum).

Darkish vegetation that develops like the seed of '*Eugenæ jambu*' is called '*kumbhikā*

(*corncous vegetations*, consisting of brown or dirty-brown, sessile, rounded growths, quite firm in structure, growing in the penis, scrotum, crural fields and anus in the male, on the labia majora, perineum and anus in woman).

*Ophthalmia (alaji)* is similar to that of gonorrhœa (*prameha*; it is probable that by *alaji* is here either meant the gonorrhœal conjunctivitis of the eye, or syphilitic gumma of the conjunctiva or sclera or parenchymatous keratitis).

If through derangement of '*vāyu*', the penis is pressed and beaten (lacking the power of erection and is pendulous) and on it appears vesicles with edema, it is called '*mrdita*' (*syphilitic edema of the penis*).

The vesicles that develop, in masturbation, are called *sammūḍha* (*herpes progenitalis* which is very pruritic appears about the glans and the foreskin, accompanied with a little moisture. When the parts are inspected in the early stages, small pin-head vesicles will be seen at the edge of the foreskin, in the neighborhood of the corona or near the meatus. When the vesicles have broken, they leave superficial erosions surrounded by minute circular or crescentric areola).

Numerous elongated growths appear, breaking.

in the middle, causing pain, and horripilation, and are called '*avamantha*' (*horns of penis*, which are usually dark-brown or green in color, in texture resembling the nails, but rough on the surface, arising from the coronal sulcus, especially near the frenum, and may attain a length of three inches. They possibly are papillomatous growths, and when protected from the air, remain moist, soft and pinkish, and when exposed become dry, hard and dark-brownish in color. On removal, usually a wart is found at their bases, and they are found in persons of careless habits and advanced life).

Due to the ( corruption of ) '*blood and pitta*' the sore that develops in the shape of the petal of lotus, surrounded by pustules, is called '*puskarikā*' (*chancroid*: it is very hard sometimes to distinguish from syphilitic initial lesion-chancere and the pyogenic ulcer-chancroid. Chancroid is contagious, its secretions being always auto-inoculable, but it is essentially a local lesion, in contradistinction to chancere which is an expression of syphilitic constitutional affection. Chancroid is due to Ducrey's streptobacillus and does not usually appear single, is not sharply circumscribed and is not indurated like the syphilitic sore. The ulcer is surrounded by minute pustules.

on the rugged edge, which is slightly inflamed, and from which if pressed, appears a thin brownish pus, for the streptobacillus is pyogenic, while the spirochete pallida is not. Differential diagnosis is very important before treatment is given, for if the chancroid is treated with mercury or iodoform ointment, it may seriously complicate the case, while with thorough cleansing and antisepsis, it can be easily cured ).

If due to the lesion of '*sūka*', the ( corrupt ) blood causes anesthesia, it is called '*sparsa hāni*' (*syphilitic anesthesia* of the penis and impotence).

Due to the indigestion, caused by '*sūka*' ( taken internally as an aphrodisiac ), '*the blood and pitta*' become deranged, and the growths that appear thereby like *Phaseolus mungo* and *Phaseolus radiatum* are called '*uttamā*' ( milia, resembling millet seeds, usually benign growths, are not infrequently found in the cutaneous investinent of the penis ).

If due to the (corruption of) '*vāyu and blood*', the penis is covered with perforating tissues like a sieve, it is called '*sata-ponaku*' ( *tuberculosis of penis* occurs in two forms. The majority of cases are examples of chronic tuberculous ulceration of the skin or the mucous membrane, the ulcers having the same irregular worm-eaten

shape, blue undermined edges and slowly sloughing or granulating cases. The other form which is rarer, appears to begin in the depth of the erectile tissue, producing a necrotic mass, closely resembling the tuberculous sequestra seen in a spongy bone. The latter form is perhaps indicated by 'sata-ponaka').

If due to 'pitta and blood', the skin of the penis ulcerates, with burning and fever, it is called 'tvak-pāka' (*erysipelas* or *cantharidal ulceration*, due to its excessive and concentrated application).

The dark, blood-tumor covered with very pruritic vesicles, is called 'sonitārvvuda' (*angioma*: though angima is more frequent than other benign tumors, it does not attack the penis so commonly as the female organs of generation. Angioma is generally seen in children, forming a superficial flat tumor, giving rarely any symptoms, unless a considerable part of the organ is involved and in that case troublesome priapism has been observed.

Due to the lesion of the tissues, develops a neoplasm, called 'māṇsārvuda' (*epithelioma or cancer of the penis*: cancer almost invariably originates on the prepuce, glans or both combined and is a disease of advanced life. The most

common mode of origin of epithelioma of the penis is in warty growths, which may promptly or after the lapse of months or years, degenerate into a malignant type. The etiology of the disease is obscure. Beside the unknown factor—tissue susceptibility, chronic irritation caused by phimosis, balanitis, venereal ulcer, especially a chronic ulcer of syphilitic origin seems to be the chief cause of cancer of the penis. It may be grafted from the cancer of the uterus where it is commoner than in man, during coitus. If the diagnosis is correct, amputation or extirpation according to the severity of the lesion, is the only safe remedy. For in many cases, destruction of tissue is marked as well as growth, and the malignant growth consists of an ulcer which may be very deep in the center with greatly thickened and indurated borders, the induration preceding the spread of the ulcer on all sides, and often the urethra is perforated so that the urine can only pass through the soft sloughing tissues, thus producing extensive ulceration ).

When ulceration takes place ( of the epithelioma ), it is called malignant '*māmsa-pāka*' ( ulceration of the cancer ).

All the symptoms of complicated tumor,

mentioned before (*Susruta* II. 9) are the same in the case of the 'vidradhi' (*sarcoma* of the penis, like the sarcoma of the other parts of the body, may be found at any time of life from childhood to old age, and is chiefly found in the tissues of the corpora cavernosa, running a rapid and insidious course, forming a tumor without any painful sensation, but enlarging and distorting the penis. If the tumor is extirpated, there is always great danger of the return of the morbid process).

If the poisonous black or multicolored '*sūka*' is used, then the tissues ulcerate with dark pigmentation and fall off; this disease originates from the (corruption) of the three humors and is called '*tila-kalaka*' (*gangrene*: Gangrene of the penis is observed in young, but more commonly in elderly, subjects. In some cases balanitis, phimosis, paraphimosis, chancre, or chancroid has been the starting point. Cases have been reported in which gangrene of the penis was said to be due to ingestion of ergot and cantharides). \*

(Of these diseases), *epithelioma* (*māṃsārvvuda*), *ulceration of the cancer* (*māṃsa-pāka*), *sarcoma*

\* R. W. Taylor: *Genito-urinary and Venereal Diseases*, p. 270.

( *vidradhi* ) and *gangrene* ( *tilakālaka* ) of the penis are incurable." *Susruta* II. 14. 3-32<sup>171</sup>.

"Masturbation, manipulation or traumatism of the penis causes the derangement of the '*vāyu*', which corrupts the ( mucous membrane of ) prepuce and causes intumescence, of the glans ; it is called '*pari-vartikā*' ( *balanitis* ) and being of '*vāyu*' and infectious origin, it is

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गोरसर्वं पतुख्या तु यकदुर्भयहेतुका ।  
पिङ्कां कफरक्ताभ्यां ज्वेया सर्पिका दुधैः ॥ ७  
कठिना विषमैरन्मैर्भास्त्रवस्त्र प्रकोपतः ।  
यज्जैस्तु विषस्तु युक्तैः पिङ्काषीलिका भवेत् ॥ ८  
शक्तैर्यत् पूरितं शशद्यग्धितं तत् कफीत्यितम् ॥ ५  
कुष्ठोक्ता रक्तपिण्डीत्या जाव्यवालिनिभा गुभा ॥ ६  
अलजीलाद्यैर्युक्तानलजीव दितक्येत् ॥ ७  
सदित् पौक्तित् यत् तु संरब्धं वायुकोपतः ॥ ८  
पाचिभ्यां भृशस्तु भूदे संसूदपिङ्कां भवेत् ॥ ९  
दीर्घा वद्वाच योङ्कां दीर्घ्यन्ते मध्यतस्तु याः ।  
सोऽवस्थः कफाद्यग्ध्या वेदनारोमहृष्टं छत ॥ १०  
पित्तशीणितसम्भूता योङ्कां पिङ्काचिता ।  
पश्चपुञ्चरस्त्वाना ज्वेया पुञ्चरिक्ति सा ॥ ११  
जनयेत् स्पर्शहानिन्द्रियाणि शक्तूवितम् ॥ १२  
हुङ्गमाषीपमा रक्ता योङ्कां रक्तपित्तजा ।  
सत्त्वमेवा तु विशेया यज्ञाजीणं निनितज्ञा ॥ १३  
हिंद्रेरशुभुख्यैर्यत् तु चित् लेडं समक्षतः ।  
वातशीणितज्ञो व्याधिर्विज्ञेयः शतपोनकाः ॥ १४

painful, causes burning and occasionally suppurates. If it originates from 'sleṣmā', it is hard and pruritic ( papilloma or any other vegetation." *Susruta* II. 13. 39<sup>172</sup>.

पित्तरक्ताङ्गतो चेयत्वक्पाको ज्वरदाहयान् ॥ १५

ज्ञाणस्त्रोटे: सरकानि: पिक्काभिष्य पीडितम् ।

यस्य वक्षिरुचयोया चेयं तच्छोचितार्दुदम् ॥ १६

मांसदोषेण जागीयादर्ढुदं मांससञ्चयम् ॥ १७

शीर्घ्यन्ते यस्य मांसानि यस्य सर्वांश्च विद्यनः ।

विद्यात् त' मांसपाकम् सर्वदोषकात्' भिषज् ॥ १८

विद्रधिं सत्रियातेन यथोक्तमभिनिर्हितं ॥ १९

ज्ञाणाणि चिदायथाया शकानि सविवाणि च ।

पातिवानि पश्चम्याशु मेदुः निरवशेषतः ॥ २०

कालानि भूत्वा मांसानि शीर्घ्यन्ते यस्य देहिनः ॥

सप्तिपातसम् त्यानं त' विद्यात् तिळकालकम् ॥ २१

तव मांसार्ढुदं यस्य मांसपाकश्च यः खृतः ।

विद्रधिष्य न सिद्ध्यन्ति ये च रयुक्तिकालकाः ॥ २२

सुहृतसंहिता, निदानस्थानम्, १४ ।

172. मर्ह नात् पीडनाचापि तर्हैवात्यभिघाततः ।

मेदुचर्घ्यं यदा वारुभजते सर्वतश्चरः ॥

तदा वातोपदृष्टम् चर्घ्यं प्रतिनिवर्तते ।

मणिरधसाम् लोशश्च गच्छिष्ठपेण सखते ॥

सवेदनः रुदाहय पाकश्च व्रजति क्वचित् ।

माहतागन्तुसञ्चूतां विद्यात् तां परिवर्त्तिकाम् ॥

सकर्षः कठिना द्वै व सैव शेषसम् त्विता ॥ १९

सुहृतसंहिता, निदानस्थानम्, १३ ।

*Balanitis* is the inflammation of the mucous membrane of the glans, or of the prepuce (*posthitis*), or to both conditions combined. The two surfaces are generally attacked simultaneously, except in chronic processes which are limited to small areas. The predisposing cause to inflammation of these parts is the difficulty or impossibility of cleansing them, especially when the foreskin is long and narrow. The active cause may be the retained pus or irritating substances of gonorrhea, chancroid, secretions of primary or secondary syphilitic lesions, or the decomposition of the accumulated smegma mixed with urine and perhaps leucorrhæal discharge added to it in coitus. The existence of vegetations under the prepuce provokes balanitis especially when the lodgment of the gonorrhæal pus excites the inflammation. Balanitis may occur also in diabetic patients, on account of the ready decomposition of their sugar-laden urine, and a certain fungus, for it is found in the smegma under the prepuce. The treatment of balanitis consists chiefly in the establishment of cleanliness, and if the prepuce can be retracted, this will usually suffice to cure. Parts may be washed with warm water of mild boric acid solution, but strong antiseptics are not desirable.

as before they can exert their germicidal effect, they are apt to provoke further irritation of already inflamed surfaces and cause the necrosis of the delicate cells, thus postponing their recuperative power.

"Excess in coitus (*simple urethritis* may be provoked, especially in gouty diathesis), continence (herpes progentitalis and reflex nervous irritability), coitus with a nun or one who has had no sexual intercourse for a long time (urethritis if the vagina is not kept clean), with a menstruating woman (menstrual blood has been regarded as an etiological factor of urethritis from remote antiquity in diverse lands. The menstrual fluid, unless decomposed or mixed with the products of bacterial evolution of one kind or another, whether the germs be autogenetic or heterogenetic, is inconsequential—can not possibly produce urethritis. Apparent contradictions are due to the autogenesis of urethritis in a previously damaged urethra, or to the washing down of the products of an old infection from the upper portion of the female sexual tract by the out-flowing menstrual secretion) or coitus with a woman whose vulva is long-haired, coarse-haired, thick-haired or there is hair in the vulvar orifice(abrasions, excoria-

tions, fissure or fine cuts made by sharp edges of the hair at certain angles by the copulative paroxysmal movements when the genital organs are in intumescent state, are the necessary and favorable conditions for the venereal germs when deposited there, to grow and multiply. Chancroidal, syphilitic or gonorrhreal germs can not cause a lesion unless they can find a lodgment and form a colony, otherwise they will be washed away by the mucous and the urinal discharges. It is only when there is an abrasion, cut, wound, tear, rent or solution of any kind of the mucous membrane, that they can find an entrance, and in the delicate epithelium, with its warmth and moisture, they find it very favorable to multiply to destroy the cells, and invade the economy in syphilis), with a woman of narrow or large vulvar orifice ( strain and injuries may be caused by narrow orifice and a flabby large vaginal passage is indicative of some disease or the reaction of the diseased condition of the genitals, as otherwise in the normal state there should be vaginal muscular contraction by the sexual stimuli and the passage of the penis ), with an unpleasant or repulsive woman ( venereal diseases, especially syphilis causes many disfigurements of the body ), with a woman who makes lavation

of her vagina with contaminated water, or one who does not make any lavation of her vagina at all, or a woman who has a genital disease, or who has a chronic lesion in her genitals, or unnatural intercourse ( sodomy does not necessarily cause any lesion unless there is an infection in either party, or venery ; excess might cause enervation and its reflex reactions on the organism, thus predisposing to any infection ), injury to the penis by nails, teeth, toxic cantharides, compression, masturbation or bestiality ( no infection can take place unless there is contact with some venereal pathogenic virus, except it might cause local injuries and pyogenic infection ), ablution of the penis with contaminated water, or its strangulation, or retention of urine or semen, or non-lavation ( uncleansing) of the penis after coitus—all these causes produce the derangement of the '*vāyu*', and provoke the inflammation of the penis, whether it has been wounded or not ; this is called '*upadamsa*'

There are five kinds of '*upadamsa*', each infection originating from five different kinds of contagions of women.

Scaliness (roughness), ulceration of the skin, torpor of the penis and inflammation with induration takes place in '*vāta-upadamsa*'(syphilitic

**chancere** : The initial lesion is first seen as a papule, varying in size from a pea to a bean, pinkish-brown in color, dry and scaling, imparting a slight resistance to the touch, which appears after an incubation of two to four weeks in syphilis, three to seven days in chancroid (which is of diagnostic value in distinguishing chancere frem chancroid) after suspicious coitus or contact, and which slowly ulcerates with slightly inflamed and indurated, circumscribed or oval edges, leaving a superficial or eroded depression, having a thin serous or sero-purulent secretion, or it may be covered with a thin grayish pellicle).

Fever (as a reaction of the organism against the invasion of syphilitic '*Spirocheta pallida*') and intumescence like the color of '*Ficus glomerata*' (which is pinkish-brown, the color of chancere) develop, and which rapidly ulcerates with '*pitta*' pain in '*pitta-upadāma*' (ulcerating chancere).

Intumescence is pruritic, hard and shiny with slight (*slesma*) pain, in *slesma-upadāma* (chancere in the first stage):

A dark tumor which bleeds excessively with fever, burning, and emaciation with all '*pitta*' symptoms, and which sometimes (spontaneously)

cures, is called 'rakta upadāmśa' (angioma of the penis on a large artery).

The intumescence ulcerates with the development of germs, which might bring about death, with all the symptoms of the corruption of the three humors in 'sarvva-upadāmśa' (syphilitic sore)." *Susruta II. 12. 7-13*<sup>178</sup>

"The contagion (syphilitic 'Spirocheta pallida') infecting the tissues and the blood, causes their

173. तवातिमैयुमादतिब्रह्मधर्यांशा तथा ब्रह्मधारिष्यो चिरोत्थटा रजसला  
दीर्घरोमा कर्कशरोमा सहीर्णरोमा निश्चरोमानन्यदारा महावारामप्रियामकामा-  
मचीचासलिलप्रधालितयोगिनिमधाकितयोगिनि योगिरोगोपष्टटा खभावतो वा दुष्टयोगि-  
विदोगि वा नारोमवर्धमपसेवमानस्य तथा करजदधनविवश्चनिपातगादङ्गाद-  
इक्षाभिवाताश्चतुष्टदीगमनादचोच्चा - सलिलप्रधाललाद्वपोङ्गाञ्जुकमूववेगविवारणामेयु-  
गान्ते वाप्रधालगादिभिर्द्वं भागस्य प्रकुपिता दीशाः चतेऽचते वा च्युषुपजनयनि-  
तमुपदंशनित्याच्छते ॥ ७

स पद्मविधस्तिर्देवेः पृथक् समसौरस्तां चैताः ॥ ८

तत् वातिके पार्वैः त्वक्परिपुटनं समसैद्धता पद्म-ज्वाफता विविधात्  
वातवैद्यनाः ॥ ९

पैसिके ज्वरः चययुः पक्षीङ्गुवरसहाश्चीत्रदाहः चिप्रपाकाः पित्रवैद्यनात् ॥ १०

झैसिके चययुः कश्चूमान् कठिनः क्षिरः शेषदेनस्य ॥ ११

रक्तां ऋषस्त्रोटप्रादुर्भावोऽत्यर्थमस्त्रक्प्रदत्तिः पित्रवैद्यनात्यर्थं ज्वरदाहो शोषण  
वाप्तवै व कदाचित् ॥ १२

दुर्बलिङ्गादर्द्दर्शनमवदर्शं श्रेष्ठः शिमिश्रादुर्भावो नरवैति ॥ १३

सुहृत्सुहिता, निहातसानम्, १३ ।

pruritis ; from pruritis develops sore ; in the sore malignant nodules are formed, enveloped in a film-like membrane, and from it exudates a viscous serous fluid (when the syphilitic process dips down into the subcutaneous tissue, and is complicated with indurating edema, the chancrous erosion becomes covered with '*indurated nodules*', while if the sore remains superficial and compact, the induration is spread out into a disk-like mass and is called *parchment-like chancre*. Parchment-like chancres are mostly found on the integument of the penis and sometimes on the vulva. '*Indurated chancres*' are mostly found in the sulcus coronarius, particularly near the frenum. When, owing to excessive cell-increase, the chancrous erosion becomes salient above the level of the parts, it is called '*ulcus elevatum*'. *Ulcus elevatum* becomes covered with a film-like membrane, having a color which is a mixture of cream with a light-green tint which degenerates into brownish black, if the membrane is not shod and exists for a long period. But if an antiseptic or iodoform is used, it melts away, leaving an erosive chancrous surface. This is known as '*chancre with the cream and the green-colored membrane*). This (chancrous nodule) kills

virility and destroys the penis (*phagedenic chancre*) ; the lesion infecting the vulva of woman produces soft, foul-smelling, umbrella-like (circumscribed) nodular chancre from which a viscid serous fluid exudates ; and this contagion ascending upward, produces gummata in the ear, eye, nose and throat. The *gummata* of the ear cause deafness, otalgia and suppuration of the ear (gumma of the auricle leads at times to deep ulceration and destruction of cartilage ; gummata on the membrane tympani occasionally cause the destruction of the membrane with ulceration ; condylomata of the meatus causes severe pain with tension and fullness and deafness may be produced merely by the mechanical closure of the meatus, but the drum membrane occasionally becomes inflamed and may suppurate. Suppurative inflammation (Otitis media suppurativa) occurs in syphilitic subjects as the direct result of the syphilitic manifestations in the naso-pharynx, and also from other causes, but the syphilitic dyscrasia is a serious complication). In the (gummato-syphilitic) affection of the eye there is obstruction of the palpebra (Tarsitis syphilitica = gummato infiltration of the tarsus ; ulcerated syphilitic mucous patches on the free margin of

the lower eyelid is commoner), ophthalmagia, lippitude (in Iritis gummosa, the exudation is gelatinous, made up of fine filaments which may be absorbed without alterations in appearance or may be changed into a bluish-white homogenous mass), and blindness (amblyopia=partial loss of vision, amaurosis=complete loss of vision in syphilis of the optic nerve, which is marked by visible changes in the papilla through: (1) choked disk or papillitis as a symptom of various intracranial processes; (2) neuro-retinitis descendens, accompanying the various changes in the brain and its meninges which have extended along the sheath of the optic nerve, or due to gumma; (3) atrophy of the optic nerve may take place either as a result of choked disk, neuritis descendens or inflammatory degeneration). Nasal (syphilitic) affection causes catarrh (the pituary membrane may be the seat of erythema, superficial ulcerations and mucous patches which give rise to symptoms of ordinary catarrh), excessive sneezing (as a reflex excited by the irritation of the nasal mucous membrane by syphilitic erythema, mucous patches, condylomata, gummata or ulcerations), dyspnea (difficulty in breathing results from mechanical obstruction, caused

by the swollen folds or in the development of adenoids stopping up the nasal passages as may be seen in congenital syphilis), ulcer of the septum ( if a gumma on the septum breaks down and ulcerates, plugs or casts of inspissated mucous, mixed with blood and pus of a very disagreeable appearance and an almost intolerable odor are discharged, especially if the necrosis of the bone has occurred. Should the lesion involve the vomer extensively, characteristically syphilitic flattening of the nose may be produced by the falling in of the bridge. The sense of smell is impaired by the failure of the odorous particles to reach the olfactory tract, owing to the obstruction of crusts and plugs of putrefying inspissated mucous ), nasal voice ( owing to the obstruction of the eustachian tube and nasal passages by swollen folds, gummata or condylomata ) and headache ( syphilitic neuralgia, the headaches being due to the lesion of the meninges which are supplied by the ramification of the trigeminal nerve : it is a very characteristic symptom of syphilis ). Affections in the pharynx, larynx and palate, cause hoarseness of voice ( huskiness of the voice is found in the syphilitic erythema of the larynx, and the phonation is interfered with, ranging from slight

hoarseness to complete aphonia according to the extent of ulceration ), ageusia ( loss of taste occurs with the ulceration and destruction of the gustatory nerve or the nerve endings on the tongue ), and the ulceration of buccal cavity ( mucous patches, gummata, etc. )” *Susruta* II 2. 15<sup>174</sup>

“In ‘udārvarta’ ( *dysmenorrhea* ) foamy (menstrual) blood is discharged with colicky spasm (colicky *dysmenorrhea* results from the attempt of the uterus to expel foreign bodies as squamous pellicles, epithelial cells, blood clots, mucous membrane and exudations, originating either from neoplasms or inflammation, which is prevented from freely flowing out with the menstrual

174. प्रकुपितःस्य दोषा भेदमभिप्रप्ना मासशोणिं प्रदृष्टं कर्षं जनयनि,  
ततः कर्ष्ण्यनात् चतं सतुपजायते, तथिं चते दुष्मांसजाः प्राहाः पित्तिलहधिर-  
खाविषो जायन्ते कूर्चिकीं इभ्यमसरसुपरिष्ठादा । ते तु शेषो विग्राशयन्तु पञ्चमि च  
पुरुषम्, योनिमधिपदाः सुकुमारान् दुर्गम्बान् पित्तिलहधिरखाविषश्ववाकारान्  
कर्मरान् जनयन्ति त एवोऽनागताः शोवाखिप्राप्यवदनिष्ठर्थं स्युपनिष्ठर्थयनि । तद  
कर्मजेषु वाधियं ददूः पूर्तिकर्षता च । नेदजेषु वक्त्रवरोधो वेदग्रामादे  
दर्शनाशय । अःषजेषु प्रतिश्वायोऽग्निमात्रं चवदुः क्षारोऽच्छासता पूर्विन्द्रं सानु-  
गाविकवाक्यत्वं शिरादुःखच । वक्त्रजेषु कर्णोऽताल्लग्नमवतामधिं कर्णदवाक्यता  
दसाज्ञानं घुलुरीयः य भद्रनि । म्यागस्तु प्रकुपितः शेषाण् परिष्ठावहिःस्थिराणि  
कोलयदर्शाणि गिर्विषयनि यानि चर्प्यकोलावर्णीस्त्वाचते ॥ १५ ॥

सुसुतस्तिता, गिदामस्तापन, २।

blood, by some obstruction as a tumor of the cervix or an atresia, caused by inflammation, following child-birth). ‘*Naṣṭārtava*’(ovarian *lesion*) causes sterility. In ‘*viplutā*’ (*hysteralgia*), the (female) genital region is always painful. In ‘*pariplutā*’ (*dyspareunia*), coitus is very painful (coitus may be painful to a woman due to (1) vaginismus ; (2) tender carunculae myrtiformes, or soreness from the laceration of the hymen in a newly married woman ; (3) inflammation of the vagina or the vulva ; (4) disproportion in size of the penis and the vaginal orifice, especially osteum vaginæ ; (5) prolapsed ovaries or uterus ; (6) pelvic peritonitis, even in multiparous women ). In ‘*vātalā*’ (*vaginitis dissecans*, in which the vaginal mucous membrane becomes dry in most instances and the superficial squamous epithelium undergoes ‘*cornification*’ and if the venereal vaginitis persists, a formation of ‘*acuminated condylomata*’ may take place in the vagina). In *raktaksrū* (*inflammatory ulceration* of the internal genital organs), the menstruation flows with burning sensation (burning sensation is felt as the blood flows over the inflammatory ulcerated surfaces, due generally to gonorrhea or syphilis). In ‘*vāminī*’ (*carcinoma uteri*) sanguinous mucous discharge appears

with gas (leucorrhœa or flour albus, a whitish discharge of a more or less viscid fluid, mucous or pus cells, is due to, '*chronic cervicitis*' and known by another name '*sreta-pradara*'). In *prostransini* (*colpitis emphysematosa*) the vagina is tremulous and tumorous (*colpitis emphysematosa* is distinguished by small-celled infiltration and hyperemia in the vicinity of numerous bubbles in and beneath the epithelium of the vaginal mucosa, formed perhaps by a gas-forming anaerobic bacterium). In '*putragni*' (*endometritis*), though there are conceptions, abortion takes place with hemorrhage (recurrent abortion is usually either syphilitic in origin, or due to endometritis from any cause or retroflexion of the uterus). In '*pittalā*' (*gonorrhœal acute salpingitis*) there are intense burning pain, suppuration and fever (gonorrhœal inflammation and the degenerative changes of the oviducts—*salpingitis*, is responsible for the frequent cases in which pregnancy, happening shortly after marriage, terminates by an abortion or so called '*one-child sterility*'). In '*atyānandā*' (*senile vaginitis*) coitus is not enjoyed (due to gonorrhœal degenerative changes, the mucosa, especially in the upper part of the canal, sheds its epithelium in patches, becomes here and there

studded with papillary granulations, shows a tendency to cicatrical contractions, and during coitus turgescence and voluptuous sensations are missing). In *karpini* (*neoplasms*), due to '*slesma and the blood*' growths are formed (in vagina myomata, fibromata, sarcomata, carcinomata, and cystomata are seen; in the uterus diffuse adenomata, polypoid adenomata, fibromata, fibroid polypuses, carcomata and carcinomata are more common). In '*acharanā*' (*vaginismus*), there is a repulsion against coitus (*vaginismus* is an abnormal sensitiveness of the external genitalia which may occasionally develop to spasmodic contraction of the constrictor, cunni, the levator ani and the muscles of the entire pelvic floor; nervous virgins on the wedding night might be its subjects if brutal attacks are made by inconsiderate husbands, if they have got leathery hymen or especially in women in whom the vulva extends far forward, so that the urethral and hymenal orifices lie upon the symphysis or the ligamentum and arquatum and such women are mostly sterile, even if cohabitation in spite of the pain is enforced). '*Aticharanā yoni*' (female sexual apparatus habituated to excessive copulation) due to excessive coitus, is neither capable of conception (it is well known

that courtesans and prostitutes who have not contracted venereal diseases are also usually sterile). In '*slegmala*' (*pruritus vulvæ*), the vulva is gummy, pruritic and chilly (vulvar pruritis may originate from various causes, as acne, eczema, acrid gonorrhreal discharges from the vagina, or the high uric acid containing or sugar-laden urine may exercise a cotinuous irritation, the decomposed and stagnated secretion makes the genital apparatus sticky, and it should be removed as in all other local lesion by frequent irrigations with weak antiseptic solutions as lysole one per cent, thymol one-tenth of a per cent, or sublimate one-twentieth of a per cent). In '*sandi*' a woman does not menstruate, her breasts are very little developed and during coitus, the vagina appears rough (*infantilismus genitalium* in which the uterus and the ovaries are incompletely developed, or androgynous masculine *pseudohermaphroditism* in which the penis is rudimentary and perforate, the scrotum fused and empty, and the central resembling the labia majora, together with the absence of testicles and the development of large breasts all conspire to convey the impression of the female sex). If a maiden with a narrow vaginal orifice has copulation with a man of very large

penis, and a fruit-like tumor is formed, it is called 'phalini' (cervicitis ; it may be also provoked by the repeated use of nodular condom )".  
*Susruta VI. 38. 5-8<sup>178</sup>*.

It has been often questioned whether the 'upadamsa' of Charaka and Suśruta is really

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175.

सा फेनिलमुदावर्ता रजः क्षक्षे य सुचति ॥  
 दम्भा नष्टार्तवा विद्यादिप्रतां नित्यवेदनाम् ॥  
 परिज्ञुतायां भवति याम्यधम्ये रजा भृशम् ॥  
 वातला कर्कशा दम्भा श्लग्निसोदपैषिता ॥  
 सदाहं प्रकिरत्यज्जयसाः सा लोहितचरा ॥  
 सवातमुद्धिरेत्वीव बामिनो रजसा युतम् ॥  
 प्रस्त्रसिनी स्पन्दते तु चोभिता दुःप्रसूय या ॥  
 श्लितं श्लितं हन्ति गर्भं पुवन्नी रक्तसंज्वात् ॥  
 अत्यर्थं पित्तला योनिर्दाहपाकञ्चरान्विता ।  
 चतुर्दश्यपि चादासु पित्तलिङ्गोक्त्यो भवेत् ॥ ६  
 अत्यानन्दा न सन्तोषं याम्यधम्ये य गच्छति ॥  
 कर्णिन्यां कर्णिका यीनौ झे आस्त्रग्भ्यानु जायते ॥  
 मैथुनाचरणात् पूर्वा पुरुषादतिरिच्छते ॥  
 वहुशशातिचरणादन्ना बीजं न विन्दति ॥  
 द्वेषला पिच्छला योनिः कष्ठयुक्तातिशीतला ॥  
 चतुर्दश्यपि चादासु द्वेषलिङ्गोक्त्यितर्भवेत् ॥ ७  
 अत्यार्तवला घटो खरम्पर्णा च मैथुने ॥  
 अतिकायन्त्रहीतायाक्षदण्डाः फलिनी भवेत् ॥

सुहृतसंहिता, उत्तरतन्त्रम्, १८

syphilis and whether the disease was known in ancient India before it was introduced into India by the Portuguese in the sixteenth century and is described graphically in *Bhāva-Prakāśa*, a work of the same age, as '*phirāṅga-roga*', the disease of the Franks, by which name Europeans were known in India, identical with the '*mal Francais or morbus gallicus*' by which it was known all over Europe.

It is well known that during the return voyage of Cristoval Colon (Christopher Columbus) from West Indies to Spain, many of the sailors who had intercourse with the Indian women of the Islands, developed specific lesions of syphilis, and they were treated on landing by Ruy Diaz de Isla who has left clinical pictures of the lesions, typical of syphilis as known to-day. In the year 1492 Cristoval Colon sailed across the Atlantic and discovered some of the outlying islands of Central America. On the fourth of January, 1493, he sailed from the West Indies on his return to Spain which was reached in the following March. Many of the sailors were treated on landing for a new disease, which is now identified with syphilis, and the symptoms of which appeared on the shipboard before their landing. On the fourteenth of June of the year

following, Nicholas Scyllatius reported an epidemic of syphilis. Soon after this Gonzalez Fernandez de Cordova, left Spain for Italy, where in a second campaign, his troops were brought into contact with those of the French. The French army numbering about 8 to 10 thousand soldiers, recruited from all parts of Europe, crossed into Piedmont on the eighth of December, in an expedition against Naples. According to the fashion of the day both the Spanish and the French army were accompanied by numerous courtesans and prostitutes for the entertainment of the soldiery. Nor was this enough. It is said that when the French soldiers reached Naples, in the intoxication of victory and unrestrained license of the age, they pillaged the convents and the homes of the rich, and spared neither the nuns nor the virgins. The army quartered in many important Italian and French cities on its return journey, left behind always in its track the '*fearful scourge of God*,' as it was called by the Church, and with the dispersal of the army, as the soldiers returned to their homes in all parts of Europe, the disease began to spread like a plague, sparing neither the cardinals, royalties nor the laity. It was known by different names, as the '*malady of*

*the Neapolitans, Portuguesse, or Spainards;*<sup>1</sup> but it was 'par excellence' known as the disease of the French (*morbus gallicus*). And one thing is clear that the history of modern syphilis can be traced step by step to the Neapolitan expedition of the French monarch Charles VIII. Bones have been exhumed of the ancient Indians, in scattered parts of America, as Colorado and Lima, exhibiting syphilitic exostosis and the results of periositis, osteitis, sclerosis, caries and other morbid processes.\*

All this definitely proves that syphilis was endemic in America, and the sailors of Columbus contracted the disease in their sexual intercourse with the Indian women, and on their return home, from their contact, it spread gradually to the rest of Europe and the modern world. But this can not warrant the assumption that syphilis in some other modified or attenuated form was not known to the ancient world. The Old Testament, the ancient Chinese medical works, and especially Charaka and Suśruta have left incontestable testimonials of the pathogenesis, evolution and the malignant course of this fateful disease. The initial lesion with chancre,

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\* Peabody Museum of American Archeology and Ethnology, Cambridge, Mass.

cutaneous manifestations, laryngeal symptoms, caving in of the nasal bridge, condylomata, gummatæ in the nose, ears and eyes, exostoses of the bones (*apachī*), all these make a complete picture of syphilis (*Susruta* II. 11. 15). But it may be said that if '*lingārṣa* or *upadamṣa*' were really syphilis, there would have been no need of writing a chapter on '*phirāṅga*' malady (*morbus gallicus*) with clear and systematic clinical picture of typical syphilis, by Bhāva-Miśra in his well-known '*Bhāva-Prakāśa*' after the Portuguese had introduced it in India, in addition to that of '*upadamṣa*', thus artificially adding a disease without reason, if both were indeed identical. Strangely, '*Mādhava-Nidāna*', a work of pathology, composed between the seventh and eighth centuries, gives its seventy-seventh chapter to '*phirāṅga roga*' and the language of both '*Mādhava-Nidāna*' and '*Bhāva-Prakāśa*' is the same. It seems clear that this must have been a later interpolation, for in Mādhavakara's time, the word '*phirāṅga*' was not known. Whatever may be the case, whether the passages are spurious or '*Mādhava-nidāna*' is a much later work than it is generally believed, it must not be forgotten that the pathogenic micro-organisms do not possess the same virulence

under all circumstances. As the seeds of a plant sown in different soils—marshy, sandy, fertile, rocky or desert wastes, and according to the mineral contents of the soil, sunshine, humidity and temperature—will vary in their foliage, growth, size of the plant and the fruit, and in course of time would evolve into sub-species, so a disease germ in the history of its evolution passes through an eventful career of exuberant growth and vitality or arrested development, its life being conditioned by the nourishment it receives and the environmental influences it is subjected to. Disease is the expression of the reactions of the organism in the struggle that ensues between the invading pathogenic germs and the host at whose expense the specific germs want to live and multiply. Two organisms are never the same. The American Indians were virtually nomads who lived by hunting. Their civilization was crude and primitive. They lacked personal and communal hygiene. They knew not the comforts of advanced '*social organizations*'—progressive and well-ordered States and Empires—in which life was settled, peaceful and regulated, and there was plenty of nutrition, medical attention and hospital facilities for all. So there is no wonder that syphilis ran a very

virulent course with them. While in Asia, it became controlled and its virulence was attenuated. Moreover, in course of time a disease becomes milder as the race becomes partially immunized by the antibodies that are elaborated by the organism as a reaction of the disease and those characteristics are transmitted from generation to generation, thus developing a partial or complete racial immunity against a specific disease. A new disease is always virulent, for the body has not yet developed antibodies as a defensive mechanism against its attack. In the fifteenth century, after its introduction by the sailors of Columbus, syphilis overran Europe as a terrible epidemic. Now the European races have been partially immunized against it, and it usually runs a very mild course, even milder than what it was fifty years ago, as descriptions left by reliable medical writers unmistakably show the horrible syphilitic ravages which are almost unknown to-day. Possibly better nutrition and hygiene have been not unimportant factors. When syphilis was first introduced in the Sandwich Islands, more than half the population was exterminated by it within a short time as by a plague. So it is very likely that when the Portuguese introduced the virulent type of

European syphilis, it appeared almost like a new disease in the severity of the symptoms and malignant sequela. The etiology of the disease became more definite and certain, and therefore all the primary and tertiary manifestations of the lesion became united and related together, and not as described before as separate diseases.

"Because in the land of the Frank(European), this disease (syphilis) is very prevalent, it is called by the pathologists, '*phiranga*' (Frank's or European) disease. This disease is developed by the physical contact of a Frank or coitus with a Frankish woman. Its another name is '*gandharoya*' (the disease that smells). It is contagious. After the incubation of the disease, the '*vāta*' becomes affected, and according to the symptom, the lesion of the '*vāta*' is to be determined.

"Syphilis manifests itself in three ways, externally, internally, or both combined. External syphilis manifests as a slightly painful papule which ulcerates like a tumor, but is easily curable. Internally gumma appears like tumescence at the joints with pain and inflammation and is very difficult to cure.

"Emaciation, loss of strength, caving in of the nasal bridge, anorexia, osteitis and osteocampsia are the symptoms of (tertiary) syphilis.

External syphilitic eruption and uncomplicated condylomata are curable. Internal manifestation (*gummata*) of syphilis is very hard to cure. But the internal complications of syphilis in a debilitated person are incurable.

*Treatment* : The ancient therapeutists have said that the application of ( calcinated and incinerated ) mercury ( *karpūrarasa* ) positively controls ( the progress of ) syphilis. And if the mercury is given in the following manner, it does not cause ulceration of the mouth : Press wheat flour with water and make a cup ( out of the paste ); place into the cup four 'guñjas' ( the berries of *Abrus precatorius*, weighing about a grain and a half each ) of mercury and make such a capsule of it that no mercury can be seen on the surface. Then rolling the capsule ( enclosing mercury ) on clove-powder, swallow it carefully with water, so that it does not come in contact with the teeth. Later, betel-nut should be chewed, and vegetables ( consisting of leaves ), acids and sodium chloride should not be indulged in. Especially fatigue, exposure to the sun, exertion and coitus must be avoided. About one-fourth of an ounce of mercury, one-fourth of an ounce of *Acacia catechu*, half an ounce of 'ākāra-karabha' ( *Echinopea echinatus* ? ) and

three-fourths of an ounce of honey pounded together in a mortar should be made into seven pills. Syphilis is destroyed by taking each of the pills every morning with water. After taking the pill, acids and sea-salt should be avoided.

*Fumigation* : Mercury one ounce, sulphur one ounce and Embelia ribes one ounce should be pounded together and made into a paste, and seven pastils are to be made out of it. If the syphilitic is subjected to the fumigation for seven days, by putting a ball into fire each day, then syphilis is certainly cured.

*Inunction* : One-fourth of an ounce of mercury is to be rubbed over the body with the juice of Michelia champaka and Barleria pubiflora by hand, as long as mercury does not entirely disappear. The fomentation is to be applied (to facilitate absorption) and if thus avoiding acids and sea-salt, inunction is applied for seven days, syphilis is cured." *Bhāva-prakāśa* IV. 50. 1-20<sup>176</sup>.

176. फिरङ्गसं चके देशे वाहुल्ये नैव यहावेत् ।

तथात् फिरङ्ग इत्युप्तो व्याधिर्व्याधिविशारदः ॥ १ ॥

**विप्रकृष्टनिदानमाह—**गच्छरोगः फिरङ्गोऽयं जायते देहिणा भृशम् ।  
फिरङ्गिनोऽङ्गसं सर्वात् फिरङ्गिष्याः प्रसङ्गतः ॥ व्याधिरागनुजो चेष्ट दोषाद्यामद  
संक्रान्तः । अवेच्च लक्ष्येतेषां लक्षणं भिर्षजा वरः ॥ १ ॥

**कृष्णमाह—**फिरङ्गलिंगिधो चेयो वाच्या आभ्यन्तरसया । बहिरङ्गलंबवसापि  
तेषां खिङ्गानि च त्रुदे ॥ तत्र वाच्याः फिरङ्गः सादिल्कोटवृद्धशील्पवक् । शुटिटो  
व्रवद्वर्देयाः सुखसाञ्चीडपि स अृतः ॥ सन्मिथाभ्यन्तरः सं सादामवात् इव अथाम् ।  
शोषण नाशयेदेव काष्ठसाञ्ची दुधेः अृतः ॥ ४—६

**उपद्रवानाह—**काश्यं नलचयो नासाभृतो वक्षेष्य मन्दता । अस्तिशोषो-  
इश्विकालं फिरङ्गोपद्रवा अनी ॥ ७

**सात्यत्सादिकमाह—**बहिरङ्गवो भवेत् साञ्ची नवीनो निरपद्रवः ।  
आभ्यन्तरसु कष्टे न साप्त्यः स्यादयमामयः ॥ बहिरङ्गलंबवो जीर्णः चीष्णसोपद्रवैर्युतः ।  
आप्तो आधिरमाञ्चीडयनित्याहुर्मुण्डः पुरा ॥ ८-९ इति फिरङ्गनिदानम् ।

**अथ फिरङ्गस्य चिकित्सा ( कर्पूररसः )—**फिरङ्गसंचकं रोगं  
रसकर्पूररसं चकः । अवश्यं नाशयेदेतद्वजः पूर्वचिकित्सकाः ॥ लिखते रसकर्पूर-  
प्राशने विधितत्तमः । अनेन विधिका खादेन्युद्धे शोथं न विन्दति ॥ गोधूमचूर्चं  
सूक्ष्मीय विदध्यात् सूक्ष्मपिकाम् । तत्राथे निःचिपेत् सूतं चतुरुंजामितं भिषक् ॥  
ततस्तु गुटिकां कुर्याद् यथा न हृषते बहिः । सूक्ष्मचूर्चं लवहस्य सां बटीमवधूतयेत् ॥  
दलस्पर्शो यथा न स्तात् तथा ताळसासा गिलेत् । ताप्त्वां भवयेत् पशाञ्चाकाञ्चलवस्त्रान्  
व्यजेत् ॥ अममातपमभावं विशेषात् स्त्रीनिषेचयम् ॥ १०—१४

**सप्तसालिघटो—**पारदद्वामानः स्तात् सदिरद्वासंनितः । आकार-  
कारभसापि यात्तद्वायोग्यितः ॥ ठहवयोग्यितं चीडं खल्वे सर्वं विनिःचिपेत् ।  
संभृतं तस्य सर्वेषां कुर्यात् सप्तवटीभिर्वक् । स रोगी भवयेत् प्रातरिकेकामन्तुगा  
वटोम् । वज्र येदद्वलवयं फिरङ्गस्त्रयं नश्यति ॥ १५—१७

**धूमप्रयोगः—**पारदः कर्पूरामावः स्तातावानेव हि गव्यकाः । तस्मालाशाच-  
मावाः स्तुरेणां कुर्यात् कञ्जलीम् ॥ तस्याः सप्तवटीः कुर्याताभिर्वृम् प्रयोगयेत् ।  
दिग्नानि उत्त तेन स्तात् फिरङ्गाको न संशयः ॥ १८—१९ इति धूमप्रयोगः ।

**पीतपुष्पवलायवरसैद्वानितं** रसम् । इत्याभ्यां नहंयेतावद् यावत् सूतो न  
हृषते ॥ ततः संसेदयेद्वसाविर्व वासुरसप्रकाम् । वर्जीञ्चलवस्त्रमवस्त्रं फिरङ्गस्त्रम्  
नश्यति ॥ भावप्रकाशः, नश्यत्वः, अृत्युक्तः, ४ ।

## VI.—THERAPEUTICS.

"The agent that normalises a diseased function is called 'therapeutics' and the application of it is the duty of the physician. That the principles of the body remain normal and do not become abnormal, is the object of 'therapeutics.'"  
*Charaka I. 16. 18<sup>17</sup>*

*Disease* is frequently caused directly and by certain states of the blood. If certain principles in the blood are diminished, due either to faulty dietary or pathogenesis, as iron or thyroid secretion which are necessary for metabolic processes, morbid conditions of health result from these causes, known as anemia (*oligochromemia*, lacking sufficient iron for the formation of hemoglobin), or myxedema (due to deficiency of thyroid secretion). They can be easily remedied by giving iron in an assimilable form as milk, meat or spinach, or thyroid glands or sea-weeds contain-

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177. यामिः क्रियाभिर्जीवने शरीरे धातुवः समाः ।

सा चिकित्सा विकाराणां कर्म तद्विषयां न ततम् ॥

कथं शरीरे धातूना 'नैव्य' न भवेदिति ।

समानाचानुवध्यः स्थादिवर्यः क्रियते क्रियते ॥

चरकसंहिता, सूत्रसागरम्, १६ ।

ing iodine as *Durvillae utilis*, *Lamianria sacarina* etc., so that the thyroid glands may manufacture the necessary colloids from them. The blood being faulty, the tissues are ill-nourished and lack the necessary resisting power against the invasion of pathogenic micro-organisms. (2) There may be also disorders due to the excess of substances in the blood as 'glucose' in glycosuria, or uric acid in gouty diathesis. If diabetes is due to defective carbohydrate metabolism, it can be cured by withholding carbohydrates from the diet, if begun when the case is not too advanced. Colchicum seems to remove the pain symptoms of gout. (3) There may be foreign bodies in the blood and their abnormal secretions, as the germs of malaria (*Plasmodium malariae*), leprosy (*Bacillus lepræ*) or syphilis (*Spirocheta pallida*). Quinine kills the malarial spores of plasmodia, chaulmoogra and its derivatives the lepra bacilli, and mercury the syphilitic spirocheta.

It is very likely that a majority of the drugs that have found place in the '*Materia Medica*' of various countries, have very little positive value. They are more or less empirical. If they cure at all, it is but symptomatic, if not psycho-therapeutic, and can not be radical.

Many people subconsciously, as in various other superstitions, feel assured against a disease, if they have taken some kind of medicine. Lacking faith in religion, they confide in pseudo-science, for the word '*science*' has a magic charm and the people are swayed by it, as by religion in the past, and the medicine-man is but a successor of the priest. That is why, the list of drugs has swelled in volume and a new drug is being added every day. The fact is that a medicine can not destroy the pathogenic germs lodged in the tissues or blood-corpuscles without destroying the tissues, or, the corpuscles. If the chemical is strong enough to kill the pathogenic micro-organisms, it might cure the disease, but it is apt to kill the patient. Of all medicines in all '*Materia Medica*s', only quinine, chaulmoogra and mercury have proved to be of some value in the treatment of malaria, leprosy and syphilis. Yet the sequela of their treatment are many and are injurious to the organism. If the organism needs iron or phosphorus, it is not only useless, but harmful, to give inorganic ferric or phosphoric salts or compounds, for the body is incapable of assimilating them and they throw additional burden upon the over-worked kidney to eliminate them.

However, from this, it will be unjust to conclude that therapeutics is a failure. As far as medication is concerned, it is certainly getting obsolete, as the people are growing in intelligence, and learning reactions of drugs. But the disease is being controlled and conquered by hygiene, prophylaxis, dietary, serum-therapy, ope.therapy, surgery and antisepsis,

Ancient Hindu Medicine was justified in emphasizing the cardinal value of hygiene and dietary in the treatment of disease, by promoting the resisting power of the organism, to enable it to cure itself of the pathogenesis. Charaka severely warns against the prescription of drugs whose action is not well-known and thoroughly tested :—

"The organism suffers if drugs are given whose names, description and actions are not well-known, or if known, has not been properly given (chemical incompatibility or over-dose). By proper chemical combination and application, even a deadly poison can become a good medicine, while a good drug by improper combination (chemical incompatibility) and application can be venomously injurious. Therefore any intelligent person who wishes cure and long life,

should not take an improper medicine. *Charaka I. 1. 48*<sup>174</sup>.

"Medicines are derived from three sources—animals, minerals and vegetables." *Charaka I. 1. 35*<sup>175</sup>.

"Of animals, honey, milk and milk-products, bile, fat, bone-marrow, blood, flesh, excreta, urine, skin (including membrane), semen, bone, tendon, horn, claw, hoof, hair, down and gall-stone are used in medicine.

Gold, five metals (silver, copper, tin, lead and iron) and their oxides, sand, carbonate of lime, arsenous disulphide, arsenous sulphide, precious stone (diamond), sea-salt, ferric carbonate of calcium and antimony (are used in medicine of the minerals).

Vegetable drugs are from four sources : 'vanas-

178. औषधं स्नानभिज्ञातं नामस्पग्येऽस्त्रिभिः ।

विज्ञातसप्दित्युर्क्तमनर्थयोपपद्यते ॥

योगादपि विषं तौल्यं उत्तमं भेषजं भवेत् ।

भेषजं वापि दुर्युक्तं तौल्यं सम्पद्यते विषयम् ॥

तथाग्र भिषजा युक्तं युक्तिवास्त्रे न भेषजम् ।

धीमता किञ्चिद्दादेयं जीवितारोग्यकाङ्क्षिणा ॥

चरकसंहिता, सूत्रस्थानम्, १ ।

179. तत्पुनस्त्रिविषं ज्ञेयं जाह्नवोऽस्त्रिदपार्थिवम् ।

*pati'* (*gymnosperms*), '*vānaspatya'* (*angiosperms*), '*oṣadhi'* (*herbs*) and '*virudh'* (*archegoniates*). Those who have fruits without flowers are called '*vanaspati'* (*gymnosperms*). Those whose fruits develop from flowers, are called *vānaspatya* (*angiosperms*). Those who only persist for the development of seeds are called '*oṣadhi'* (*herbs*). Those which expand (*pratūna*, by climbing, as the fern *Lygodium palmatum*) are called, '*virudh'* (*archegoniates*)."  
Charaka I. 1. 36-38<sup>180</sup>.

"Root (*mūla*), bark (*tvak*), pith (*sāra*), gum-resin (*niryyāsa*), culm (*nāḍa*), juice (*svarasa*), leaves and flowering top (*pallava*), vegetable alkali (*kṣāra*), milky exudation (*kṣīra*), fruit (*phala*), flower (*puspa*), ash (*bhasma*), oil (*taila*),

१८०. मधुनि गोरमाः पितं वसा मज्जासूगाभिषम् ॥  
 विष्मृत्युचर्चरितेऽस्त्रियाशुश्रवान्नाः खुरा ।  
 अङ्गमीभ्यः प्रयुज्यन्ते केशलोभानि रोचनाः ॥  
 सदर्थं समलाः पश्चलोङ्घाः ससिकता सुधा ।  
 मनःशिलालि मणयो लव उ गेरिकाङ्गने ॥  
 भीममीषधसुहिष्टमीहिदन्तु द्वर्तुर्विधम् ।  
 वनस्पतिकथा वीर्ण्डानस्पत्यस्थीषधिः ॥  
 फलैर्ब्वनस्पतिः पुष्पैर्व्वानस्पत्यः फलैरपि ।  
 शीषधः फलपाकान्ताः प्रतानैर्वीकृधः शूताः ॥  
 चरक-स'हिता, सद-स्थानम्, १ ।

thorn (*kantaka*, for opening superficial cutaneous abscess), leaf (*patra*), flower-bud (*śīṅga*), rhizome and bulb (*kanda*), and bud (*praroha*=undeveloped shoot) of plants are used as medicines."

*Charaka I. 1. 38<sup>181</sup>.*

"The fluid that is extracted by pressing any (vegetable or animal) substance in a machine, is called juice (*svarasa*). Anything that is beaten into semi-solid consistency in a mortar, is called *paste* (*kalka*). The liquid preparation of any (vegetable) drug, obtained by boiling with water, is called by the therapeutists, *Decoction* (*śrta*). The preparation that comes out by steeping a (crude) drug in cold water, and passing it through a sieve after exposing it to the dew-drops of the night (that is the crude drug is to be kept soaked in water at least for 12 hours), is called *Infusion* (*sīta*). If any ground drug is poured into boiling water, and the preparation is passed through a sieve, it is called, *Tea* (*phāuta*)."

*Charaka I. 4. 8<sup>182</sup>.*

181. मूलत्वक् सारमिद्यास-नाड़-स्वरसपद्मवाः ।  
चाराः चेरं फलं पुष्पं भूषा तैलानि कण्ठकाः ।  
पदाणि गुडाः कन्दाश्च प्रोटोडायीङ्गिदो गदः ॥  
चरक-संहिता, सूत-स्थानम्. १।

182. यन्त्रप्रपोङ्गाह्याद्वासः स्वास उच्यते ।  
यत् पिण्डे रसपिण्डानां तत् कल्कं परिकोऽन्तिमं ॥

Cerebral Sedatives : "Fructus Achyranthes aspera (*apāmārga*), Piper longum (*pippalī*), Piper nigrum (*maricha*), Embelia ribes (*ridāṅga*), Moringa pterygosperma (*śigra*), Sinapis alba (*sasarpa*), Xanthoxylon alatum (*tumburu*), Nigella sativa (*ajājī*), Ocimum gratissimum (*ajagandhā*), Salvadoria persica (*pīlu*), Elletaria major (*elā*), Piper aurantiacum (*hareṇukā*), cardamomi semina (*prthvīkā*), Ocimum basilicum (*surasā*) Clitoria ternatea (*śvetā*), Ocimum sanctum (*kuṭheruka*) Ocimum villosum (*phanijjhaka*), fructus Albizzia lebbek (*sīriṣa*), Allium sativum (*laṣuna*), Curcuma longa and Berberis asiatica (*haridrū* and *dāru-haridrā*), sodium chloride and rock-salt (*lavanya-dvaya*), Cardiospermum halicacabum (*jyotiṣmatī*), and zingiber officinale (*nāgara*) these are *Cerebral Sedatives*. These are also used in migraine, cephalalgia, catarrh, helmet-headache, syphilitic gumma (*krimivyādhī*-bacterial lesion ?), apoplexy, anosmia and epilepsy.

*Emetics* : Randia dumetorum (*madana*), Gly-

वज्रौतु कृयित् दद्यं प्रसमाहुषिकिसकः ।

द्रव्यादापेधितात्मोये तत् पुणिंशि संखितात् ॥

काशायो योऽभिनिर्याति स शीतः समुदाहतः ।

चिमोण्टीये वृदित् तत् फाण्डूं परिकोर्चितम् ॥

चरक-संहिता, स्वस्थानम्, ४ ।

*cyrrhiza glabra* (*madhuka*), *Azadirachta indica* (*nimba*), *Achyranthes aspera* (*jīmūta*), *Achyranthes fruticosa* (*kṛta-vedana*), *Piper longum* (*pippalī*), *Mallotus philippensis* (*kūṭaja*), *Citrullus colocynthis* (*ikṣvāku*), *Elletaria major* (*elā*) and *Achyranthes obtusifolia* (*dhāmārgava*) are to be used as Emetics in proper doses, in intestinal, 'pitta' and 'gleṣma' diseases without causing any injury to the organism.

*Purgatives* : *Ipomoea* ( *Convolvulus* ), *turpethum* (*trivṛt*), *Terminalia chebula*, *Terminalia belerica* ( *Myrobalan* ) and *Emblema* (*Phyllanthus*) *officinalis* (*tri-phalī*), *Balsospermum moatanum* (*dantī*), *Ipomoea caerulea* (*nīlinī*), *Abrus precatorius* (*saptalā*), *Acorus calamus* (*vacha*), *Mallotus philippensis* (*kampillaka*), *Clitoria ternatea* (*govākṣi*), *Mimusops kauki* (*ksīriṇī*), *Luffa amara* (*udakiryyka*), *Salvadora persica* (*pilu*), *Cassia fistula* (*āragvudha*), *Uvae passae* (*drākṣā*), *Balsospermum indicum* (*dravanti*) and *Barringtonia acutangula* (*nichula*) are to be used as *Purgatives* in intestinal diseases, *Sterospermum suaveolens* (*pāṭali*), *Premna serratifolia* (*agnimantha*), *Aegle marmelos* (*vilva*), *Oroxylum* ( *Calosanthus* ), *indicum* (*śyonāka*), *Gmelina arborea* (*kāśnaryya*), *Desmodium triflorum* (*śālaparnī*), *Uraria logopodoides* (*pr̥sniparṇī*), *solanum xanthocarpum* (*nidigdhikā*),

Sida cordifolia (*valā*), Tribulus lanuginosus (*asvadāmṣṭrā*) Solanum indicum (*vr̥hatī*), Ricinus communis (*eranda*), Boerhaavia procumbens (*punarnavā*), Hordeum hexastichum (*yava*), Dolichos uniflorus (*kulattha*), Zizyphus jujuba (*kola*), Tinospora cordifolia (*guluchi*), Randia dumetorum (*madana*), Butea frondosa (*palāśa*), Andropogon citratum (*karttrna*), oils and salts are to be used (as purgatives) in constipation and in the formation of the feces." *Charaka I. 2-5<sup>1+3</sup>*.

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183. अग्नमार्गस्य वोजानि पिप्पली मरिचानि च ।  
 विडङ्गान्यथ शियुनि सर्वं पास्तुक्षयि च ॥  
 अजाजोस्त्राजगत्याच्च पीलून्येतां हरेणुकाम् ।  
 पृथ्वीकां मुरसां शेतां कुठेरकफणिजभकौ ॥  
 विवरीषधोजं लगुनं हरिद्रे लवणशयम् ।  
 व्यालिगतां नागरच दद्याच्छीर्षं विरेचने ॥  
 गोरधं शिरमः शूले पीनसेऽर्जादभेदके ।  
 क्रोम्याधावनद्यारे त्रायनाम् प्रसोहः ॥  
 मदनं सधुकं निर्वं जीमूतं क्षतवेधनम् ।  
 पिप्पलकुटजे च्छाकुण्डेलां धार्मागवाणि च ॥  
 उर्पस्थिते शेषपिते व्याधावामाशयाश्रये ।  
 यमनाथं प्रयुज्ञात भिषग् देहमदूषयन् ॥  
 विहतां विफगा दन्तीं नोखिनीं समलां बचाम् ।  
 कण्ठिल्लकं गवाशीच्च चारिष्णीसुदकीर्थकाम् ॥

*Antiparasitics* : Cassia fistula (*ārayādha*), Cassia tora (*aidagaja*), Luffa amara, Justicia adhatoda (*vāsā*), Tinospora cordifolia, Randia dumentorum, Curuma longa, Berberis asiatica, Acacia gummifera (*śryāhva*), Cedrus deodara (*surāhva*), Acacia catechu (*khadira*), Tomentosa latifolia (*dhava*), Azadirachta indica, Embelia indica, Nerium odoratum (*karavīraka*), Betula bhojpattra (*bhūrjā*), Allium sativum, Albizzia lebbek, Laurus cassia (*lomaśa*), Balsamodendron pubescens (*guggulu*), Moringa (*zeylanica*) pterygosperma (*kriśnagandhā*), Ocimum villosum, Mallotus philippensis, Alstonia scholaris, Salvadoria persica, Saussurea lappa (*kuṣṭha*), Jasminum grandiflorum (*sumana*), Acorus calamus, Piper angustifolium (*reṇukā*), Ipomoe turpethum, Beliospermum montanum, Acaju officinalis

पालून्नारम्भं द्राशां द्रवन्तीं निचुलानि च ।  
 पक्षाशयगते दोषे विरेकार्थं प्रयोजयेत् ॥  
 पाटलिच्छाप्तिमध्यत्वं विल्वं श्वेष्याकमीव च ।  
 काशमयीं शालपर्णीस्त्रं पृश्चिपर्णीं निदिग्धिकाम् ॥  
 बलां चदंडां हड्डीमेरच्छं सपुर्नवम् ।  
 यवान् कुलत्वान् कीलानि गुडुचीं मदनानि च ॥  
 पलाशं कर्तुषक्षेष्व चे हाँस खवणानि च ।  
 उदाकर्त्ते विवर्वेषु युज्ञादास्थापनेषु च ॥

चरकसंहिता, सू. ३४८

(*bhallātaka*), ferric calcium carbonate (*gairika*), antimonious sulphide (*añjana*), arsenous sulphide (*āla*), arsenous disulphide (*manahśilā*), fuliginis alcalina (*grha-dhūma* = a complex empyreumatic substance, deposited from smoke, made up chiefly of a resinous substance combined with lactic acid, carbonous matters and creasote, besides various mineral salts), *Elletaria major* (*elā*), ferric sulphide (*kāśīsa*), *Symplocos racemosa* (*lodhra*), *Terminalia arjuna* (*arjjuna*), *Achyranthes aspera* (*musta*) and *Shorea robusta* (*sarija*) are kept together with the bovine gallstone for seven days, and then having crushed the gall-stone, the linimenta is mixed with *oleum sinapis*, and applied over the body as an unguent, then obstinate psoriasis, leucoderma, alopecia, keloid, tinea imbricata, scrofulide, fistula-in-ano and eczema are cured within a short time.

*Saussurea lappa*, *Curcuma longa*, *Berberis asiatica*, *Ocimum basilicum*, *Trichosanthes dioica*, *Azadirachta indica*, *Withania somnifera* (*asvagandhā*), *Cedrus deodara*, *Moringa pterygo-sperma*, *Sinapis alba*, *Xanthoxylon budrunga* (*tumvurū*), *Coriandri fructus*, *Scrupus capsularis* (*vanya*) and *Andropogon acicularis* (*chandā*) are to be ground in equal proportion and mixed with whey, and if then it be rubbed over the

body as an unguent, pruritus, eruption, urticaria and tumescence become cured.

Saussurea auriculata, Coccus cordifolius (*amrita*), Hydrocarpus kurzii or copper-sulphide (*asanga*), Berberis asiatica, ferric sulphide, gummi Rotleria tinctoria (*kampillaka*), Achyranthes aspera, Symplocos racemosa, Andropogon shoenanthus (*sangandhika*), Shorea robusta, gummi Vateria indica (*sarja-rasa*), Embelia indica, arsenous disulphide, arsenous sulphide, and Nerium odorum—relieve tinea imbricata, pruritus, keloid, eczema and scrofulide, if these are ground and rubbed over the body, smeared with unguents.” *Charaka I. 3. 2-4*<sup>181</sup>.

184. आरवधः सैङ्गजः करञ्जो वासा गुणुचो मदनं हरिद्रे ।

श्याहः सुराहः खदिरो धवश निम्बो विडङ्ग' करबीरकत्वक् ॥

यन्त्रिष्ठ भौत्यो लग्नः शिरेषः सलोमशो गुग्गुह्यगन्धे ।

फण्डिनः भक्तो वस्त्रकसनपर्णी पांचूर्णि कुञ्जं सुमनः प्रवासाः ॥

वचास्त्रेष्विडता निकुञ्जो भल्लातकं वैरिकमद्वन्द्व ।

मनः शिलाले गृहधूम एलाकाशीशलोभः अंगुष्ठसमज्ञाः ॥

इत्यर्दृपे विहिताः पद्मे गोपितपीताः पुनरेव पिटाः ।

चिदानि काञ्चापि नवं किलाशं सुरेन्द्रलुम्प' किटिम' सददु ।

भगव्दराज्ञा' स्वपर्वीं सपानां हन्तुः प्रयुक्तास्त्वचिदाद्रात्रात्मा ॥

कुष्ठं हरिद्रे सुरसं पटोलं निष्वावगन्धे सुरदाह शियु ।

सुर्वपं तुमुखावगन्धे चण्डालं चर्चानि समानि कुर्वात् ॥

*Anodynes* : "Radix Nymphaea lotus, Cedrus deodara, Saussurca lappa, Glycyrrhiza glabra, Elletaria major, Nelumbium speciosum (*kamala*) Nymphaea stellata (*ulpala*), Aquilaria agallocha (*loha*), Typha angustifolia (*erakā*), Nymphaea lotus (*padmaka*), Andropogon acicularis—if these are used as a liniment, headache is relieved. Aerides tesselatum (*rāsnā*), Curcuma longa, Berberis asiatica, Valeriana dioica, Foeniculum vulgare and Anisi fructus, Cedrus deodara, Saccharum officinarum and Cælogyne ovalis (*jīvanti* = *cæla*) if compounded and mixed with clarified butter and oleum sesami, and applied as a liniment after warming it, pain is relieved.

*Demulcents* : Musci (*śaivāla*), Nymphaea lotus, Nymphaea stellata, Calamus rotang (*vetra*), Calophyllum inophyllum (*tung*), radix Nymphaea lotus, Andropogon muricatum, Symplocos racemosa, Aglaia edulis, Pterocarpus

तैलाक्षपिण्डैः प्रथमं शरोरं तैलाक्षसुवर्चयितुं यतेत् ।

तेनास्थ कस्तुः पिङ्का॑ः सक्षीठा॑ः कुष्ठानि शोफाच शमं प्रजन्ति ॥

कुष्ठाक्षतासङ्कटहट्टरै॒ काशीशकम्पिङ्गकसुखलोभम् ॥

सौगन्धिकं सर्ज रसो विङ्गः॑ मनःशिलालि करबीरकलव् ॥

तैलाक्षगावस्थ छतानि चूर्णान्वेतानि दद्यादवचूर्णं नार्थम् ॥

दहुः॑ सकाष्ठः॑ किटिमानि पाना विचर्दिका चैव तदैति शान्तिम् ॥

चरकसंहिता, दह-स्तानन, १ ।

santalinus, if applied as a liniment, after pasting and mixing them with clarified butter, the irritation of a burn is relieved. Ipomoea digitata (*sitā*), Rubia cordifolia, Calamus rotang, radix Nymphaea lotus, Glycyrrhiza glabra, Citrullus colocynthis (*aindrī*), Nymphaea lotus, Panicum frumentaceum (*durvā*), radix Hedysarum alhagi (*yavasa-mūla*), Poa cynosuroides, Saccharum spontaneum (*kāśa*), and Typha angustifolia, if applied as a liniment, irritation of the skin is relieved. Lichen (*saileyam*), Elletaria major, Aquilaria agallocha, Saussurea lappa, Andropogon acicularis, Tabernæmontana coronaria (*nata*) Cinnamomum zeilanicum (*tvak*), Cedrus deodara, Aerides tessellatum, Albizzia lebbek and Mimosa indica, if applied as a plaster on a venous bite, the burning irritation is relieved.

*Diaphoretics* : Albizzia lebbek, Mimosa indica, Mesua speciosa (*hema*), and Symplocos racemosa, if rubbed upon the skin in the powder form, it relieves skin-lesion and causes perspiration.” *Charaka I. 3. 16-21<sup>ss</sup>.*

185. प्रपोल्करोकं सुरदार्क छाहं यस्याहमेला कमलोत्पत्ति च ।  
 शिरोहजाया सहतः प्रदेहो लोहेरकापचक-चोरदैव ॥  
 राक्षाहर्त्रे नक्षत्रं शताह्वे है देवदार्ढ्यि सितोपसाच ।  
 जीवन्मित्रूष्टं सहतं सतैखमाहिपनं पार्वद्वजासु कोषम् ॥

*Analeptics* : "Celtis orientalis minor (*jīvaka*), Vitis vinifera (*r̄ṣavaka*), Leptadenia reticulata (*medā*), Leptadenia spartium (*mahamedā*), Gymnema balsamicum (*kākoli*), Gymnema lactiferum (*kṣūra-kākoli*), Phaseolus trilobus (*mudga-parṇī*), Teramnua labialis (*māṣaparṇī*), Cœlogyne ovalis and Glycyrrhiza glabra—these ten are vitalizing astringent drugs.

*Tonics* : Mimusops kauki (*kṣirinī*), Oxytelma esculentum (*rājakṣavaka*), Cordia latifolia (*valā*), Gymnema balsamicum, Gymnema lactiferum, Cordia officinalis, Cordia myxa, Hibiscus vitifolius, Batatas paniculata and Ipomoea batatas—these ten are tonic astringents.

*Epispastics* : Cyperus rotundus, Saussurea lappa, Curcuma longa, Berberis asiatica, Acorus calamus, Aconytum heterophyllum, Picrorrhiza

यैवाकपशोत्पलवेदतुङ्गं प्रपीछरोकाख्यं वणालबोधम् ।  
 प्रियहु कालीयकचन्दनानि निर्बाधयः स्थात् सघृतः प्रदेहः ।  
 चितालतावेतसपद्मकानि यथाह्नौ नद्रो नलिनानि दूर्घर्षं ।  
 यवासमूखः कुशकाशयष्ठ निर्बाधयः स्थात् जलमेरका च ॥  
 शैलीयलागुरुची सकुडे चक्षा नतं लक् सुरदाहरादा ।  
 शीतं निहत्तादचिरात् प्रदेहो विषं शिरीषसु सुसिन्धुवारः ॥  
 शिरीषलाभज्ञकहिमलोहे स्तन्दोषसंसेदहरः प्रवर्णः ।  
 चरक-इ-हिता, सूत्र-स्थानम्, १ ।

*kurroa*, *Plumbago zeylanica*, *Pongamia glabra* and *Ipomoëa indica*—these ten are reductive.

*Pustulants* : *Convolvulus turpethum*, *Asclepias gigantea*, *Eicinus communis*, *Gloriosa superba*, *Kubia cordifolia*, *Plumbago zeylanica*, *Pongamia glabra*, *Andropogon acicularis*, *Picro-rhiza kurroa* and *Cleome felina*--these ten cause suppuration.

*Vulneraries* : *Glycyrrhiza glabra*, *Tinospora cordifolia*, *Uraria logopodioides*, *Stephania herandifolia*, *Mimosa pudica*, *Bombex malabaricum*, *Grislea tomentosa*, *Symplocos racemosa*, *Aglaia edulis*, and *Myrica sapida*--these ten promote the healing of wounds..

*Irritants* : *Piper longum*, radix *Piper longum*, *Piper chava*, *Plumbago zeylanica*, *Zingiber officinale*, *Rumex vesicarius*, *Piper nigrum*, *Pimpinella saxifraga*, *Semecarpus anacardium* and *Ferula asafoetida*--these ten are rubefacient.

*Tonics* : *Citrullus colocynthis*, *Carpopogon pruriens*, *Asparagus sarmentosus*, *Phaseolus trilobus*, *Convolvulus paniculatus*, *Withania somnifera*, *Desmodium triflorum*, *Picrorrhiza kurroa*, *Sida cordifolia*, and *Sida rhombifolia*--these ten are tonics ( strengthening ).

*Rubefacients* : *Pterocarpus santalinus*, *Calophyllum inophyllum*, *Nymphaea lotus*, *Andropo-*

gon muriculatum, Glycyrrhiza glabra, Rubia cordifolia, Hemidesmus indicus, Convolvulus paniculatus, Panicum frumentaceum and Panicum dactylon—these ten bring redness to the complexion.

*Expectorants*: Hemidesmus indicus, radix Saccharum officinarum, Glycyrrhiza glabra, Piper longum, Uvae passae, Convolvulus paniculatus, Myrica sapida, Hydrocotyle asiatica, Solanum indicum, and Solanum xanthocarpum—these ten stimulate bronchial (mucous membrane).

*Heart-Stimulants*: Mangifera indica, Spondias mangifera, Artocarpus lakoocha, Carissa carandas, Tamarindus indica, Rumex vesicarius, Prunus acida, Prunus acacia, Punica granatum, and Citrus medica—these ten stimulate the heart.

*Coffrigerants*: Zingiber officinale, Plumbago zeylanica, Piper chaba, Embelia ribes, Saussurea zeylanica, Tinospora cordifolia, Acorus calamus, Cyperus rotundus, Piper longum and Trichosanthes—these ten allay thirst.

*Hemostatics*: Holarrhena antidysenterica, Aegle marmelos, Plumbago zeylanica, Aconitum heterophyllum, Terminalia chebula, Alhagi maurorum, Berberis asiatica, Acorus calamus, and Piper chava—these ten cure piles.

*Antiparasitics* : *Acacia catechu*, *Terminalia chebula*, *Phyllanthus emblica*, *Curcuma longa*, *Semescarpum anacardium*, *Alstonia scholaris*, *Cassia fistula*, *Nerium odorum*, *Embelia ribes*, and *Jasminum grandiflorum*, *Pterocarpus santalinus*, *Nardostachys jatamansi*, *Cassia fistula*, *Pongamia glabra*, *Azadirachta indica*, *Holarrhena antidysenterica*, *Sinapis alba*, *Glycyrrhiza glabra*, *Berberis asiatica* and *cyperus rotundus* cure the skin diseases.

*Counter-irritants* : *Pterocarpus santalinus*, *Nardostachys Jatamansi*, *Cassia fistula*, *Pongamia glabra*, *Azadirachta indica*, *Holarrhena antidysenterica*, *Sinapis alba*, *Glycyrrhiza glabra*, *Berberis asiatica* and *cyperus rotundus* relieve pruritus (by dilating the superficial vessels).

*Anthelmintics* : *Moringa pterigosperma*, *Piper nigrum*, *Tithymalus antiquorum*, *Colocasia antiquorum*, *Vitex negundo*, *Embelia ribes*, *Achyranthes aspera*, *Tribulus terrestris*, *Clerodendron serratifolium* and *Salvadora persica* are vermifuge (cause the destruction or expulsion of the intestinal worms).

*Antidotes* : *Curcuma longa*, *Rubia cordifolia*, *Aerides tessallatum*, *Ichnocarpus frutescens*, *Pterocarpus santalinus*, *Strychnos potatorum*, *Albizzia lebbek*, *Vitex negundo* and

*Cordia myxa*—these ten destroy ( neutralize ) poisons.

*Galactogogues*: *Andropogon muricatum*, *Oryza sativa*, a sub-species of *Oryza sativa*, *Saccharum officinarum*, *Saccharum cylindricum*, *Poa cynosuroides*, *Saccharum spontaneum*, *Tinospora cordifolia*, *Abelmoschus moschatus*, and *Hemionetis esculenta*—these ten increase milk.

*Anti galactogogues*: *Stephania hernandifolia*, *Zingiber officinale*, *Cedrus deodara*, *Cyperus rotundus*, *Saussurea zeylanica*, *Tinospora cordifolia*, *Holarrhena antidysenterica*, *Agathotes cherayta*, *Picrorrhiza kurroa*, and *hemidesmus*—these ten reduce the production of milk.

*Aphrodisiacs*: *Celtis orientalis*, *Vitis vinifera*, *Gymnema balsamicum*, *Gymnema lactiferum*, *Phaseolus trilobus*, *Terranovia labialis*, *Leptademia spartium*, *Asparagus racemosus*, *Nardostachys jatamansi* and *Rhus succedania*—these ten increase semen.

*Anaphrodisiacs*: *Saussurea auriculata*, *Feronia elephantum*, *Myrica sapida*, *os sapiae*, *Nauclea cadamba*, *saccharum purificatum*, *Hygrophila spinosa*, *Ruellia longifolia*, *Sesbania grandiflora* and *Andropogon muricatum*—these ten reduce semen (diminish sexual desire and power).

*Adipogenous agents* :—*Uvae passæ, Glycyrrhiza glabra, Tinospora cordifolia, Leptademia spartium, Convolvulus paniculata, Gymnema balsamicum, Gymnema lactiferum, Celtis orientalis, Caelegyne ovalis and Desmodium triflorum*—these ten cause the formation of fat (in the body.)

*Diaphoretics* :—*Moringa pterigosperma, Ricinus communis, Asclepias gigantea, Boerhaava diffusa, Boerhaava procubens, Hordeum hexastichum, Sesamum indicum, Dolichos biflorus, Phaseolus trilobus, and Zizyphus jujuba*—these ten increase perspiration (by stimulating the sudoriparous glands).

*Emetics* :—*Mel, Glycyrrhiza glabra, Bauhinia variegata, Bauhinia acuminata, Nauclea cadamba, Calamus fasciculatus, Cephalandra indica, Crotalaria verrucosa, Asclepias gigantica and Achyranthus aspera*—these ten cause vomiting.

*Purgatives* :—*Uvae passae, Gmelina arborea, Grewia asiatica, Terminalia chebula, Phyllanthus emblica, Terminalia belerica, Zizyphus jaccifera, Zizyphus jujuba, Zizyphus napeca and Salvadoria persica*—these ten are purgatives.

*Enemata* :—*Ipomœa turpethum, Aegle marmelos, Piper longum, Holarrhena antidysen-*

terica, *Sinapis alba*, *Acorus calamus*, *fructi Holarrhena antidysenterica*, *Peucedanum graveolens*, *Glycyrrhiza glabra*, and *fructus Randia dumetorum*—these ten are (suited) for enema.

*Oily-enemata* :—*Vanda roxburghii*, *Cedrus deodara*, *Aegle marmelos*, *Randia dumetorum*, *Peucedanun graveolens*, *Boerhavia diffusa alba*, *Boerhavia diffusa rubra*, *Tribulus terrestris*, *Premna serratifolia* and *Oroxylum indicum*—these ten are (fitted) for oily-enemata.

*Cerebral sedatives* :—*Cardiospermum halicabum*, *Sinapis nigra*, *Piper nigrum*, *Piper longum*, *Embelia ribes*, *Achyranthes aspera*, *Sinapis alba*, *Moringa pterogospermum*, *Clitorea ternatea*, and *Clitorea mariana*—these ten are Cerebral sedatives (possibly an errhine is meant).

*Anti-emetics* :—*Eugenia jambolana*, *Mangifera indica*, *Citrus medica*, *Zizyphus jujuba*, *Punicum granatum*, *Hordeum hexastichum*, *Andropogon muricatum*, diatomaceous earth, and pop corn—these ten are anti-emetics (by allaying the irritability of the gastric nerves or the vomiting centers or neutralizing the toxins which irritate those centers).

*Refrigerants*—*Cyperus pertenuis*, *Alhagi maurorum*, *Cyperus rotundus*, *Oldenlandia herbacea*, *Pterocarpus santalinus*, *Agathotex chira-*

yata, Tinospora cordifolia, Pavonia odorata, corandrum sativum and Trichosanthes dioica—these ten allay thirst.

*Pulmonary sedatives* : Curcuma zerumbet Costus speciosus, Zizyphus jujuba, Solanum xanthocarpum, Solanum indicum, Cymbidium tessalooides, Terminalia chebula, Piper longum, Alhagi maurorum and Rhus succedania—these ten relieve hiccup (by allaying irritability of the respiratory center or the terminal fibers of the nerves distributed to the bronchi and lungs).

*Laxatives* : Aglaia roxburghiana, Hemidesmus indicus, fructus Mangifera indica, Colosanthus indicus, Symplocus racemosa, gummi Bombax malabaricum, Mimosa pudica, Grislea tomentosa, Clerodendrum indicum, and fructus Nymphaea lotus—these ten cause the formation (evacuation) of feces.

*Cholagogues* :—Eugenia jambolana, Boswellia serrata, Mucuna pruriens, Glycyrrhiza glabra, Bombax malabaricum, Pinus longifolia, edible diatomaceous earth (containing oxide of iron which gives it a red-yellowish color), Balatas paniculatus, Nymphaea stellata, and fructus Sesamum indicum—these ten give color to the feces (by causing the increased secretion of the bile).

*Urinary diluents* :—*Eugenia jambolana*, *Mangifera indica*, *Ficus infectoria*, *Ficus Bengalensis*, *Spondias mangifera*, *Ficus glomerata*, *Ficus religiosa*, *Semecarpus anacardium*, *Oxalis acetosella* and *Acacia catechu*—these ten increase the quantity of urine.

*Urinary-antacids or anticeptics* :—*Nelumbian speciosum*, *Nymphaea stellata*, *Nymphaea alba*, *Nymphaea rubra*, *Nymphaea odorata*, *Nymphaea lotus*, *Nymphaea pubescens*, *Glycyrrhiza rubra*, *Aglaia roxburghiana* and *Grislea tomentosa*—these ten purify the urine.

*Diuretics* :—*Costus speciosum*, *Tribulus terrestris*, *Sesbania grandiflora*, *Cleome viscosa*, *Colcus amboinicus*, *Imperata cylindrica*, *Poa cynosuroides*, *Saccharum spontaneum*, *Panicum frumentaceum* and *Saccharum sara*—these ten increase the excretion of urine.

*Pulmonary sedatives* :—*Uvae passae*, *Terminalia chebula*, *Phyllanthus emblica*, *Piper longum*, *Alhagi maurorum*, *Rhus succedania*, *Solanum xanthocarpum*, *Boerhavia diffusa rubra*, *Boerhavia diffusa alba*, and *Phyllanthus nirury*—these ten relieve coughing (expectorants?).

*Respiratory stimulants* :—*Curcuma zerumbet*, *Costus speciosum*, *Rumex vesicularis*, *Ellettaria cardamomum*, *Ferula assafoetida*, *Ocimum*

sanctum, *Phyllanthus niruri*, *Caelogue ovalis*, and *Andropogon*—these ten relieve dyspnea.

*Styptics* :—*Stereospermum suaveolens*, *Premna serratifolia*, *Aegle marmelos*, *Colosanthes indica*, *Gmelina arborea*, *Solanum xanthocarpum*, *Solanum indicum*, *Desmosium trilobum*, *Uraria logopodioides*, and *Tribulus terrestris*—these ten reduce inflammation.

*Antipyretics* : *Hemidesmus indicus*, rock candy, *Stephania rotunda*, *Rubia cordifolia*, *Uvæ passæ*, *Salvadora persica*, *Grewia asiatica*, *Terminalia chebula*, *Phyllanthus emblica* and *Terminalia bellerica*—these ten relieve fever.

*Spinal stimulants* : *Uvæ passæ*, *Phoenix sylvestris*, *Buchanania latifolia*, *Zizyphus jujuba*, *Punica granatum*, *Ficus glomerata*, *Grewia asiatica*, *Saccharum officinarum*, *Hordeum hexastichum* and a variety of *Oryza sativa*—these ten remove fatigue.

*Vascular sedatives* : Pop corn, *Santalum album*, *fructus Gmelina arborea*, *Glycyrrhiza glabra*, rock-candy, *Nymphaea stellata*, *Andropogon muricatum*, *Hemidesmus indicum*, *Tinospora cordifolia* and *pavonia odorata*—these ten relieve 'œstus' (internal congestion), by moderating the cardiac excitement, and rendering the heart's action more slow or less forcible.

*Vascular stimulants* : *Cassia auriculata* (*Tabernaemontana coronaria* ?), *Aquilaria agallocha*, *Coriandrum sativum*, *Zingiber officinale*, *Carum ajowan*, *Acarus calamus*, *Solanum xanthocarpum*, *Paemna serratifolia*, *Colosanthus indica*, and *Piper longum*—these ten relieve the chilly sensation (by accelerating the circulation, acting on the heart and the blood-vessels).

*Emollients* : *Diospyros glutinosa*, *Buchanania latifolia*, *Zizyphus jujuba*, *Acacia catechu*, *Acacia bombolah*, *Alstonia scholaris*, *Shorea robusta*, *Terminalia arjuna*, *Terminalia tomentosa*, and *Acacia farmensiana*—these ten relieve (the burning sensation) of erysipelas.

*Antirheumatics* : *Desmodium trilobum*, *Urtica logopodiooides*, *Solanum iudicum*, *Solanum xanthocarpum*, *Ricinus communis*, *Gymneria balsamicum*, *Santalum album*, *Andropogon muricatum*, *Eleteria cardamamum*, and *Glycyrrhiza glabra*—these ten relieve rheumatic (gouty) pain (by dissolving uric acid deposits),

*Counter-irritants* : *Piper longum*, *radix Piper longum*, *Piper chaba*, *Plumbago zeylanica*, *Zingiber officianale*, *Piper nigrum*, *Pimpinella involucrata*, *Seseli ubanotis*, *Cuminum cyminum*, and *Achyranthes repens*—these ten relieve pain.

*Styptics* : Mel, Glycyrrhiza glabra, Crocus sativus, Bombax malabaricum, diatomaceous earth (containing oxide of iron), ferric calcium carbonate, Symplocos racemosa, Aglaia roxburghiana, rock candy, and pop corn—these ten arrest the flow of blood (by vascular contraction).

*Anodynes* :—Shorea robusta, Myrica sapida, Nauclea cadamba. radix Nymphaea lotus, Calophyllum, inophyllum, Bombax malabaricum, Albizzia lebbek, Calamus rotung, Feronia elephantum and Saraca indica—these ten relieve pain.

*Anaesthetics* : Ferula assafoetida, Melia azedarrach, Acacia farnesiana, Acorus calamus, Andropogon acicularis, Herpestis monieri, Corydalis cava, Nardostachys jatamansi, Saraca indica, and Picrorrhizah kurroa—these ten abolish consciousness (by inhibiting the functions of the higher cerebral centers).

*Aphrodisiacs* : Citrullus colocynthis, Herpestis monieri, Panicum dactylon, Panicum frumentaceum, Steriospermum suaveolens, Terminalia chebula, Picrorrhiza kurroa, Sida cordifolia, and Aglaia roxburghiana—these ten increase the reproductive powers.

*Analeptics* : Tinospora cordifolia, Terminalia chebula, Phyllanthus emblica, Vanda roxbur-

ghii, Panicum dactylon, Caelogyne ovalis, Hemidesmus indica, Hydrocotyle asiatica, Desmodium trilobum, and Bœrhaavia asiatica—these ten prolong life." *Charaka* I. 4. 12-62<sup>10</sup>.

186. जीवकर्षं भक्तौ मेदा नंहामेदा काकोली चौरकाकोली सुहमापपस्त्रौं जीवत्रौं भधुकमिति दशेमानि जीवनेयानि भवन्ति ।

जीरियो राजचबद्धं वला काकोली चौरकाकोली वाक्यायनी भद्रोदनी भारदाजी पयसर्पं गन्धा इति दशेमानि दृष्टियानि भवन्ति ।

मुखकुडहरिद्रा दाकहरिद्रा वचातिविषा कटुरोहिणी चितक  
चिरविल्वहैमवत्य इति दशेमानि लेखनीयानि भवन्ति ।  
सुहडाकोरुकाप्रिसुखो चिदा चिदक चिरविलशङ्किनी  
अकुलादनीस्तर्यं चीरिण्य इति दशेमानि भेदनीयानि भवन्ति ।  
मधुक मधुपर्शीं पृथिपर्खं बृष्टको सुमङ्गा भोचरस घातको  
लोध्र प्रियङ्गु कट्कलानोति दशेमानि सभानीयानि भवन्ति ।  
पिप्पलोपिप्पलोमूलचव्यचित्रकपृष्ठवेराञ्जवेतस भरिचाजमोदा  
भक्षातकासिं हिङ्गु निर्याता इति दशेमानि दीपनीयानि भवन्ति ।  
ऐन्द्रप्रथयतिरसर्थं प्रोत्ता पयसाश्वगभास्यिरा रोहिणी  
वलातिवला इति दशेमानि वस्त्यानि भवन्ति ।  
चन्दनतुङ्गपद्मकोशीर भधुकमस्त्रिहासारिवापयस्या सितालता  
इति दशेमानि वस्त्यानि भवन्ति ।  
सारिवेञ्चमूलमधुक पिप्पलो द्राचाविदारीकेटथ्यैंसपादी-  
हहती कट्कारिका इति दशेमानि वस्त्यानि भवन्ति ।  
आवाचातकगिरुचकरमहं उच्चाच्चाञ्जवेतसुकुमलवदरदाङ्गिम-  
मातुषुङ्गानीति दशेमानि वस्त्यानि भवन्ति ।

1. *Pectorals* : “Desmodium trilobum, Batatas paniculata, Sida cordifolia, Sida spinosa, Tribulus terrestris, Uraria logopodioides, Aspara-

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नागर चित्कचव्यविहङ्गमूर्च्छार्गुडु चोबधामुख पिपली  
पटीलानीति दशेमानि दृष्टिप्राणि भवन्ति ।  
कूटज विल चित्क नागरातिविषाभया धन्वथासक-दार-  
हरिद्रा-वचाचव्यानाति दशेमानि अर्शोद्धानि भवन्ति ।  
खुदिराभयामलका हरिद्रादक्षर सप्तपर्णीरगुध करवार-  
विहङ्गजातिप्रवाला इति दशेमानि कुष्ठप्राणि भवन्ति ।  
चन्दननखदक्षतमालनकामाल निष्ठकूटज सर्षपमधुकदार-  
हरिद्राम् सानीति दशेमानि करुष्ठप्राणि भवन्ति ।  
अचोबसीधगखीरकेवूक विहङ्ग निर्गुण्डो-किञ्चिर्वाचदं ए-  
हषपर्णीकाखुपर्णी का इति दशेमानि श्रिभिप्राणि भवन्ति ।  
हरिद्रामन्त्रिष्ठासुवह्नासुक्षेलापालिन्दीचन्दन कलक शिरीष  
सिंघुवार द्वेषातका इति दशेमानि विषप्राणि भवन्ति ।  
बीरण-शालीष्ठिकेश्वालिका दर्भकुश-काशगन्द्वे ल्कट  
कर्णमूलानीति दशेमानि स्वच्छन्नानि भवन्ति ।  
पाठामहीषध सुरदारमुक्तमूर्च्छा गुडुची-वलक-फलकिरातदिति-  
कटुरोहिणीसारिवा इति दशेमानि सत्यगोधनानि भवन्ति ।  
जीवकर्षभककाकोलीचीरकाकोलीहुइपर्णी माघपर्णीनेदाहच-  
रहाजटिलाकुलीझा इति दशेमानि शुक्र-जन्मानि भवन्ति ।  
कुष्ठे लवालुककट्फलसम्बुद्धिए कदम्बनिर्यासेश्वकाखे चु-  
चुरकवसुकोशीराणीति दशेमानि शुक्रशोधनानि भवन्ति ।  
सहीकामधुकमधुपर्णीमेदविदारी काकोलीचीर-काकोली  
जीवकजीवमौ-शालपर्णी इति दशेमानि खेहोपगानि भवन्ति ।

*gus racemosus, Ichnocarpus frutescens, Hemidismus indicus nigra, Celtis orientalis minor,*

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ओमाक्षनकैरखाकंडवीर पुनर्वायवतिकाक्षत्वमावद-  
राशीति दशेमानि खेदोपगानि भवन्ति ।  
मधुमधुक कीविदार कर्ण्दारकानीय-विदुलविज्ञीशणपूषी-  
सदापुषी प्रत्यक्षपुष्ट्या इति दशेमानि बमनीपगानि भवन्ति ।  
द्राक्षकाशर्य प्रत्यक्षाभयामलक-विभीतक कुबलवद-  
कर्ण्दपूषीसूग्नीति दशेमानि विरेचनीपगानि भवन्ति ।  
विहित्स पिपली कुट सर्व पवता बलकफल शतपुष्ट्या-  
मधुकमदगक्षानीति दशेमान्वाश्वापगानि भवन्ति ।  
राक्षसुरदाक्षविलमदन शतपुष्ट्या-इक्षोरपुर्वन्धा चढ़ा-  
पिण्ड खोगका इति दशेमान्वजुवासनोपगानि भवन्ति ।  
ज्योतिश्चतीचवक मरिचपिपलीविहङ्ग शिशु सर्वपापामार्गतच्छु-  
शेता महारेता इति दशेमानि शिरीविरेचनीपगानि भवन्ति ।  
जन्मादप्रवृत्तमातुलुङ्गाक्षवदरदाफिनयव वटिकीशीर-  
महाजा इति दशेमानि छह्विनियहसानि भवन्ति ।  
नागरधन्य यासकमुक्तपर्यटक-चन्दनकिरातिमाकाशुचीझीवेर  
धान्यक पटोलानीति दशेमानि दृश्य-नियहसानि भवन्ति ।  
घटीपुष्करमूलवदरदोज कर्ण्दकारिका हड्डीहृष्वदहाभयापिपली-  
दुरालभाकुलीरमहा इति देवे मानि हिङ्गानियहसानि भवन्ति ।  
प्रियहङ्ग नन्तामास्थि कटूङ्ग-लोध्र नीचरस समझा चात्कौपुष्ट्य  
पदा पश्चकेशरामीति देवे मानि पुरीवस्त्रहृष्वोयानि भवन्ति ।  
जन्मुश्वाकीलकृतक्षुरा मधुक शाकली श्रीवेष्टक मृद  
क्षाप्यवस्त्रोत्पत्तिक्षक्षा इति दशेमानि पुरीय-  
विरजनीयानि भवन्ति ।

*Vitis vinifera, Teramnus labialis, Phaseolus trilobus, Solanum indicum, Solanum xanthocarpum, Boerhaavia diffusa, Ricinus communis,*

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अन्नायुग्र बट कपोतनोऽनुवरातव-भजातकाशमृतकसोम

बल्का इति हशे मानि सूतसंयुक्तानि भवन्ति ।

पश्चीपल नविनकुमुदसीमध्यिक पुष्टरोक शतपदमधुक-

प्रियङ्गु शातकोपुष्पाचीति दशे मानि सूतविरजनीयानि भवन्ति ।

हवादणीवदं दृष्टसूक्ष्मिर पावासमेद दर्भंकुशकाशयुक्ते त्

काटवृक्षानीति दशेमानि सूतविरजनीयानि भवन्ति ।

द्राक्षाभयामलक-पिण्डीदुराक्षा शङ्खीकट्टकारिका इयोर

पुण्यंवा तामलक्य इति दशेमानि वासहराचि भवन्ति ।

गङ्गी पुष्करमूलाज्ञवेतसेषाहिङ्गु गुरु सुखा तामलकी

जोवनी चक्षा इति दशेमानि वासहराचि भवन्ति ।

पाटकापिधमृत्य विलङ्घीचाक-काशमर्यकट्टकारिका इहती शालपर्णी

पृथिवीपर्णी-गोचुरका इति दशेमानि शीघ्रहराचि भवन्ति ।

शारिवाशकंरा पाठा भविष्ठा द्राक्षा पंचू पद्मकाभया-

मलक्षविभीतकानीति दशेमानि अवहराचि भवन्ति ।

द्राक्षाखन्तुर पिण्डी बदर दाकिन फला यज्ञवैद्युत्यव-

यादिका इति दशेमानि अवहराचि भवन्ति ।

लाजाचन्दनकाशमर्यफलमधुक शर्करा गोचोपल्लीशीर शारिवा

गुण्डीबेराचीति दशेमानि दाढप्रशमनानि भवन्ति ।

तमरागुरु-शामक-गङ्गवैद्युतोकवचा कट्टकारिकाप्रिमन्द्य

श्वीकाकपिष्यस्य इति दशेमानि शीतप्रशमनानि भवन्ति ।

तिकुकपियाकबदर खुदिरकदर सप्तपर्णवकर्णचुंजासगा-

रिमिदा इति दशेमानुदृग्म प्रशमनानि भवन्ति ।

*Clitoræ ternata*, *Tragia involucrata*, and *Mucuna (Carpopogon) pruriens*. These are called 'vidāri' and they relieve the derangements of 'vāyu' and 'pitta', consumption, tubercles, gouty pains, dyspnea and other bronchial troubles.

II. *Antiseptics*: *Cassia fistula*, *Randia dumetorum*, *Flacourtie ramontchi*, *Holarrhena antidysenterica*, *Stephania capitata*, *Acacia catechu*, *Stereospermum suaveolens*, *Sansevieria zeylanica*, *Holarrhena antidysenterica*, *Alstonia scholaris*, *Azadirachta indica*, *Barleria prionitis*, *Barleria buxifolia*, *Tinospora cordifolia*, *Plum-*

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विदारिगम्भा इत्त्रिपथोऽहसी करटकारिकैरण्डकाकीलीचन्द-  
नोशीरेखामधुकालीति दशेमान्यङ्गमद्वप्रशमनानि भवन्ति ।  
पिप्पली पिप्पलीमूल चव्य-चित्रक शङ्खवेर मरिचाजमोदाज-  
गम्भाजाजी गरुडीराणीति दशेमानि गूलप्रशमनानि भवन्ति ।  
मधुमधुकरुधिर मोचरस चत्कापालयोधरौरिक प्रियङ्ग  
शर्करालाजा इति दशेमानि शोणितस्थापनानि भवन्ति ।  
शाल कट्टफल कादम्बपद्मक तुङ्ग नोचरस गिरीषवज्रुले लब्ध-  
काशोका इति दशेमानि वेदनास्थापनानि भवन्ति ।  
हिङ्गुकैटर्यारिमेदा वचा चीरक वयःस्थागोलोमी वटिलाप  
लङ्घवाशोकरोहिण्य इति दशेमानि सुंचास्थापनानि भवन्ति ।  
ऐन्द्रीत्राह्लीश्वत्रीर्यांसुहस्तवीर्यामोचाव्यथा शिवारिष्टा वाष्पयुक्ती-  
विश्वक्सीनकान्ता इति दशेमानि प्रजास्थापनानि भवन्ति ।  
अवताभया धावी मुक्तावेना जीवन्यतिरसा मखुकपथो  
स्थिरा पुर्वज्ञा इति दशेमानि वयःस्थापनानि भवन्ति ।

*bago zeylanica*, *Pongamia glabra*, *Carissa caranda*, *Trichosanthes dioica*, *Ophelia chirayta*, and *Momordica charantia* are called ‘*āragdhādi*’, and they are disinfectants in catarrh, toxemia, gonorrhœa, skin disease, and abscess-cavities and relieve fever, vomiting and pruritus (as symptomatic expressions of the former lesions).

III. *Hæmatinics* : *Cratæva religiosa*; *Barleria cærulea*, *Morunga plerygosperma*, *Hyperanthera morunga*, *Seshania aculeata*, *Gymnema sylvestris*, *Guilandiña bonducella*, *Pongamia glabra*, *Sansevieria zeylanica*, *Premna serratifolia*, *Barleria cristata*, *Momordica monadelpha*, *Coccinea indica*, *Calotropis gigantica*, *Pothos officinalis*, *Plumbago zeylanica*, *Asparagus racemosus*, *Aegle marmelos*, *Gymnema sylvestris*, *Imperata cylindrica*, *Solanum indicum* and *Solanum xanthocarpum* are called ‘*varuṇādi*’, and they relieve (the derangements of) ‘*kapha*’ and adiposis, headache, adenoncosis and adenitis.

IV. *Lithontriptics* : *Pentaptera arjuna*, *Barleria cærulea*, *Barleria cristata*, *Imperata cylindrica*, *Vanda roxburghii*, *Cyperus pertinens*, *Arundo indica latifolia*, *Poa cynosuroides*, *Saccharum spontaneum*, *Coleus aromaticum*, *Premna serratifolia*, *Sansevieria zeylanica*,

*Calotropis gigantea*, *Scindapsus officinalis*, *Calosanthes indica*, *Barleria prionitis*, *Nymphaea stellata*, *Herpestis monieri*, and *Tribulus terrestris* are called '*viratarvādi*' and they relieve stranguary, gravel and urinary calculus.

V. *Oxidizer* : *Resina Shorea robusta*, *Terminalia alata tomentosa*, *Acacia catechu*, *Acacia arabica*, *Diospyros embryosteris*, *Areca catechu*, *Betula bhojapatra*, *Gymnema sylvestris*, *Ougenia dalbergisides*, *Santalum album*, *Pterocarpus santalinus*, *Dalbergia sissoo*, *Albizia lebbek*, *Terminalia tomentosa*, *Anogeissus latifolia*, *Terminalia arjuna*, *Borassus flabelliformis*, *Tectona grandis*, *Pongamia glabra*, *Guilardina bonducella*, *Shorea robusta*, *Aquilaria agallocha*, and *Santalaum xanthocarpum* are called '*sāla-sārādi*', and these relieve phlegma, ediposis, and skin-diseases, gonorrhœa and anemia.

VI. *Astringent disinfectants* : *Symplocos racemosa*, *Symplocos alstonia*, *Butea frondosa*, *Calosanthes indica*, *Clerodendron siphonanthus*, *Myrica sapida*, *Myrica rubra*, *Boswellia serrata*, *Rubia cordifolia*, *Shorea robusta* and *Musa sapientum* are called '*rodhrādi*', and they relieve phlegmatic disposition and adiposis, and vaginal diseases, arrest diarrhoea, disinfect abscess cavity and neutralize toxins.

VII. *Disinfectants* : *Calotropis gigantica*, *Calotropis gigantica alba*, *Pongamia glabra*, *Guilandenia bonducella*, *Heliotropium indicum*, *Achyranthes aspera*, *Clerodendrum*, (*siphonanthus*, *Vandra roxburghii*, *Gloriosa superba*, *Batatas paniculata* *Batatas epulis*, *Tragia involucrata*, rock salt, *Balanites roxburghii* are called '*arkādi*' and they relieve phlegmatic disposition, adiposis, intestina, worms, skin diseases, neutralize toxins and disinfect abscess cavity.

VIII. *Pectorals* :—*Ocimum sanctum*, *Ocimum hirsutum*, *Ocimum frutescens*, *Andropogon shoenanthus*, *Andropogon martiny*, *Andropogon muricatum*, *Andropogon iwaraneusa*, *Cassia esculetana*, *Achyranthes aspera*; *Hygrophylla spinosa*, *Eiabelia ribes*, *Myrica sapida*, *surasī*, *Vitez negundo*, *Celsia caromandeliana*, *Salvinia cucullata*, *Clerodendron siphonanthus*, *Ruta graveolens*, *Solanum nigrum* and *Strychnos nux-vomica* are called '*surasādi*' and they relieve phlegmatic disposition, bacterial flora, catarrh, anorexia, dyspnea and cough and disinfect abscess cavity.

IX. *Lithontriptics* :—*Bignonia indica*, *Butea frondosa*, *Grislea tomentosa*, *Plumbago zeylanica*, *Randia dumetorum*, *Dalbergia sissoo*, *Euphorbia*

*neriifolia*, *Terminalia chebula*, *Terminalia belerica* and *Phyllanthus embelica* are called '*muskādi*' and they relieve adiposis, urethral diseases, gonorrhea, chancre, anemia (symptomatic of the other lesions), gravel and urinary calculus.

X. *Stomachics* : *Piper longum*, *radix Piper longum*, *Piper chaba*, *Plumbago zeylanica*, *Zingiber officinale*, *Piper nigrum*, *Scindapsus officinales*, *Piper auranticum*, *Elettaria cardamomum*, *Pimpinella involucrata*, *fructus Holarrhe-na antidyserterica*, *Stephania hernandifolia*, *Cuminum Cyminum*, *Sinapis alba*, *fructus Melia azadaroch*, *Ferula assafoetida*, *Clerodendron siphonanthus*, *Sansevieria zeylanica*, *Aconitum heterophyllum*, *Acorus calamus*, *Embelia ribes* and *Picrorrhiza kurroa* are called '*pippalyādi*' and they are appetizing, stomachic and dessicant, and they relieve catarrh, flatulence, anorexia, glandular swelling and pain.

XI. *Carminatives* : *Elettaria cardamomum*, *Tabernæmoutana coronaria*, *Saussurea auraticulata*, *Nardostachys jatamansi*, *Andropogon shœnanthus*, *Cinnamomum zeylanicum*, *Cinnamomum tamala*, *Mesua ferrea*, *Agraia roxburgiana*, *Piper aurantiacum*, operculum of *Purpura*, *Tamirindus indica*, (*sukti* = pearl-oyster), '*sthauneyaka*' (a yellowish fragrant plant), *Canscora*

*decussata*, *Pinus longifolia*, *Cinnamomum pauciflorum*, *Andropogon acicularis*, *Sida cordifolia*, *Balsamodendron mukula*, *Shorea robusta*, *Liquidambar orientalis*, *Boswellia serrata*, *Aquilaria agallocha*, *Trigonella corniculata*, *Andropogon muricatum*, *Cedrus deodara*, *Crocus sativus*, and *Calophyllum inophyllum* are called '*elādi*' and they relieve flatulence, phlegmatic disposition, pruritus and urticaria.

XII-XIII. *Stomachics* : *Acorus calamus*, *Cyperus rotundus*, *Aconitum heterophyllum* *Terminalia chebula*, *Cedrus deodara*, *Mesua ferrea*, *Curcuma longa*, *Berberis asiatica*, *Uraria logopodioides*, *Holarrhena antidysenterica*, and *Glycyrrhiza glabra* are called *vachādi* and *hari-drādi* and they are galactagogue, antidysenteric and particularly stomachic.

XIV. *Laxatives* : *Hemidesmus indicus*, *Ichnocarpus-frutescens*, *Ipomoea turpethum*, *Baliospermum montanum*, *Canscora decussata*, *Symplocos racemosa*, *Mallotus philippensis*, *Trichosanthes dioica*, *Areca catechu*, *Salvinia cucullata*, *Citrullus colocynthis*, *Cassia fistula*, *Pongamia glabra*, *Guilandina bonducilla*, *Tinospora cordifolia*, *Stereospermum suaveolens*, *Argyreia speciosa*, *Eupholia neriifolia* and *Cleome felina* are called *syāmādi* and they relieve tympanites and ascites.

XV. *Diureties* : *Solanum indicum*, *Solanum xanthocarpum*, *Holarrhena antidysenterica*, *Stephania hernandifolia*, and *Glycyrrhiza glabra* are called '*vṛhatyādi*' and they relieve the excess of the humors, anorexia, eructation and strangury.

XVI. *Disinfectants* : *Trichosanthes dioica*, *Santalum album*, *Pterocarpus santalinus*, *Sansevieria zeylanica*, *Tinospora cordifolia*, *Stephania hernandifolia*, and *Picrorrhiza curroa* are called *paṭalāḍdi* and they are beneficial in anorexia, fever, pruritus, and particularly in the asepsis of the abscesses.

XVII. *Analeptics* : *Gymnema balsamicum*, *Gymnema lactiferum*, *Celtis orientalis*, *Vitis vinifera*, *Phaseolus trilobus*, *Teramnus labialis*, *Leptadenia spartina*, *Leptadenia reticulata*, *Tinospora cordifolia*, *Rhus succedama*, manna *Bambucæ*, *Prunus padus* (?), *Nymphaea lotus*, *Nymphaea odorata*, *Nymphaea pubescens*, *Mimusops kauki* and *Glycyrrhiza glabra* are restorative, stimulant, tonic galactogogue and phlegmatic.

XVIII. *Lithontriptics* : Alkalies, rock salt, Bitumen, iron sulphide, *Assafœtida* and copper sulphide are called *uṣakāḍdi* and they relieve phlegmatic disposition and adiposis, and urinary calculus, gravel and strangury.

**XIX.** *Vascular Sedatives* : Ichnocarpus frutescens, Glycyrrhiza glabra, Santalum album, Pterocarpus santalinus, Prunus padus, Gmelina arborea, Bassia latifolia, and Andropogon muricatum are called *sārvādi* and they relieve polydipsia, hemorrhage, biliary fever and especially hyperemia.

**XX.** *Hemostatics* : Sulphate of antimony, incinerated antimony, Mesua ferrea, Aglaia roxburghiana, Nymphaea stellata, Andropogon muricatum radix, Nelumbium speciosum, and Glycyrrhiza glabra are called *añjanāddi* and they relieve hemorrhage, toxemia and internal congestion.

**XXI.** *Carminatives* : Grewia asiatica, Uvae passae, Myrica sapida, Punica granatum, Mimusops indica, Strychnos potatorum, Tectonia grandis, Terminalia chebula, Terminalia belerica, and Phyllanthus emblica are called *paruṣkādi* and they relieve flatulence, urinary troubles, polydipsia, and are appetizing and cardiac stimulants.

**XXII.** *Antiseptics* : Aglaia roxburghina, Mimosa pudica, Woodfordia floribunda, Calophyllum inophillum, Pterocarpus santalinus, Cæsalpinia sappan, Bombax malabaricum, antimony sulphide, diatomaceous mixture of antimony (?), Nelumbium speciosum, Rubia

cordifolia, and *Ichnocarpus frutescens* are called '*priyaṅgvādi*' and they are beneficial in ulcerative dysentery, for rejoining the fractured bones and as pustulants for the tumors.

**XXIII. Pustulants :** *Stephania hernandifolia*, *Woodfordia floribunda*, *Mimosa pudica*, *Calosanthes indica*, *Glycyrrhiza glabra*, *Aegle marmelos*, *Symplocos racemosa*, *Symplocos alstonia*, *Butea frondosa*, *Nerium coronarium*, and *Nelumbium speciosum* are called *ambuṣṭhādi* and they are pustulant, and are beneficial in fractured bones.

**XXIV. Pustulants :** *Ficus bengalensis*, *Ficus gloremata*, *Ficus religiosa*, *Ficus infectoria*, *Bassia latifolia*, *Spondias mangifera*, *Terminalia arjuna*, *Mangifera indica*, *Mangifera sylvatica*, *Andropogon acicularis*, *Cinnamomum tamala*, *Eugenia corymbosa*, *Buchanania latifolia*, *Glycyrrhiza glabra*, *Picrorrhiza kurroa*, *Mimusops elengi*, *Nauclea cadamba*, *Zizyphus jujuba*, *Diospyros ebenaster*, *Boswellia serrata*, *Symplocos racemosa*, *Symplocos alstonia*, *Semicarpus anacardium*, *Butea frondosa*, and *Cedrela toona* are called '*nyagrodhādi*' and they are pustulants and beneficial in the reunion of the fractured bones and are vaginal disinfectants.

**XXV. Antipyretics :** *Tinospora cordifolia*,

**Azadirachta indica**, **Coriandrum sativum**, **Santnum album** and **Prunus padus** are called '*guduchyādi*' and they are febrifuge, stomachic and relieve eructation, anorexia, polydipsia and *hyperemia*.

**XXVI. Refrigerants** : **Nymphaea stellata**, **Nymphaea rubra**, **Nymphaea alba**, **Nymphaea odorata**, **Nymphaea cœrulea**, **Nelumbium speciosum** and **Glycyrrhiza glabra** are called '*utpalādi*' and are refrigerant, antitoxic, hematinic, anti-emetic, and relieve heart diseases and epilepsy.

**XXVII. Oxidizers**: **Cyperus rotundus**, **Curcuma longa**, **Terminalia chebula**, **Phyllanthus emblica**, **Terminalia belerica**, **Saussurea auriculata**, **Acorus calamus**, **Stephania hermanifolia**, **Picrorrhiza kurroa**, **Pongamia glabra**, **Aconitum heterophyllum**, **Elettaria cardamomum**, **Semicarpus anacardium** and **Plumbago zeylanica** are called '*mustādi*' and they are oxidizing agents (reducing phlegma) stimulating digestion, increasing the secretion of milk (in woman) and act as disinfectants in vaginal diseases.

**XXVIII. Astringent antiseptics** : **Terminalia chebula**, **Terminalia belerica**, and **Phyllanthus embelica** are known as *triphalā* and they are beneficial in gonorrhea, skin-diseases, in some eye-troubles and they are stomachic.

**XXIX.** *Stomachics* : *Piper longum*, *Piper nigrum* and *Zingiber zerumbet* are called *trikāṣṇa* and they are oxidizing agents and are beneficial in phlegmatic disposition, adiposis, diabetes, skin-diseases, glandular swelling, and anorexia.

**XXX.** *Stomachics* : *Phyllanthus emblica*, *Terminalia chebula*, *Piper longum* and *Plumbago zeylanica* are called *āmalakyādi* and they are tonic, stimulating, febrifuge and beneficial to the eyes.

**XXXI.** *Metallic salts* : Tin, lead, silver, iron and gold (salts), and iron-oxide are called *trapādi* and they are bacteri-cidal, antitoxic and beneficial in anemia and gonorrhea. (*Tin* compounds are no more used in modern medicine except as filings though in former times *stannum oxidatum* and *butyrum stanni*, were popular. *Lead oxide*, *unguentum plumbi iodidi*, and various other salts and preparations of lead are in use, usually for external application. *Copper* likewise has various external therapeutic uses. The oleate of copper is an admirable astringent, antiseptic and anti-parasitic preparation, especially valuable in various forms of *tinea trichophytosis*; copper sulphate in solid stick is effectively used as a superficial caustic in indolent ulcers, exuberant granulations, and in syphilitic and other sores in the mouth.

and the throat. *Silver nitrate* in weak solutions has been used externally as an astringent caustic and internally in nervous disorders with marked benefit. But as it leaves a dark stain on the skin, *argentum Crede* is preferred by many, as the lactate and citrate of silver is claimed to possess the power of penetrating the entire organism and effecting a general disinfection of the entire organism. Argonin, an organic combination of silver with casein, soluble in water, but non-irritant, has been lately introduced in the market and is claimed to be antidotal to the gonococcus. Argyrol, another non-irritant combination, is used in 2 p. c. solution in gonorrhœal eye-diseases. Various *iron preparations* are still in vogue and administered internally to supply iron to hemoglobin in its deficiency as in anemia. *Gold* and sodium chloride has marked bactericidal powers, resembling mercuric chloride and internally in very small doses it acts upon the glandular structures of the stomach and the liver, stimulating nutrition and assimilation; but in larger doses it produces violent gastro-enteritis without salivation or ulceration).

**XXXII.** *Antiparasitics* : Lac, Cassia fistula, Holarrhena antidysenterica, Nerium odorum, Myrica sapida, Curcuma longa, Berberis asiatica,

*Azardirachta indica* Alstonia, *scholaris*, *Jasminum grandiflorum* and *Ficus heterophylla* are called '*lāksādi*' and they are of astringent, bitterish sweetish taste and are antiparasitical.

**XXXIII. Tonics :** The roots of *Trilobus terrestris*, *Solanum indica*, *Solanum xanthocarpum*, *Uraria logopodioides*, *Desmodium trilobus*, are known as '*pañcha-mūla*' and they are of astringent sweet-bitterish taste and are restorative tonics.

**XXXIV. Stomachics :** The roots of *Aegle marmelos*, *Premna serratifolia*, *Calosanthes indica*, *Stereospermum suaveolens* and *Gmelina arborea* are called large '*pañcha-mūla*' and they are stomachics of slightly bitter-sweetish taste.

**XXXV. Oxidizers :** The five small roots and the five large roots, are called together '*daśa-mūla*' and they are stomachic and febri-fuge.

**XXXVI. Antiseptics :** The roots of *Batatas paniculata*, *Ichnocarpus frutescens*, *Curcuma longa*, *Tinospora cordifolia*, and *Gymnema sylvestre* are called '*valli-pañchamūla*'. The roots of *Carissa carandas*, *Tribulus terrestris*, *Barleria cristata*, *Asparagus racemosus* and *Hygrophila spinosa* are called '*kantaka pañchamūla*'. These two '*pañchamūlas*' relieve inflammation and gonorrhœa.

**XXXVII.** *Diuretics* : The roots of Poa cynosuroides, Saccharum spontaneum, Phragmites communis, Imperata cylindrica and Saccharum officinarum are called ‘*trna pañcha-mūla*’ and if given with milk, they are diuretic and cure urinary troubles.” *Susruta I. 38. 2-36*<sup>107</sup>.

187. समासेन सप्तविंशत्यगणा भवन्ति । तद्यथा—विदारिगच्छा विदारो सहदेवा विशदेवा चदंडा पृथक् पर्णे शतावरी सारिवा क्षणसारिवा जीवकर्ष भक्ती महासहा चुद्रसहा वृहत्यी पूर्वनवैरख्ये हंसयादी इस्तिकाल्याषभी चेति ।

विदारिगच्छादिरियं गणः पित्तानिलापहः ।

शीघ्रगुच्छाइमहींहृ-शास्त्रकासुविनाशनः ॥ २

आरवधमदनगोपधीयटाकरटकीकुटजपाठापाटलामूख्ये नद्यव-सप्तपर्ण-निष्ठ-कुबृष्टकदासीकुबृष्टक-गुडूचीचित्रकशाहृष्टाकरञ्जियपटोलिकिराततिकानि सुषवी चेति ॥

आरगृधादिरियेष गणः श्वेषविषापहः ।

मैहकुष्ठज्वरदमी-कश्युद्धी ब्रशशीधनः ॥ ३

वद्यार्थगर्वंशयु मधुर्शिर्यु तकारीमिष्ठस्त्रीपूतिकनक्तमालमोरटाप्रिमग्न्यसैरीथकवृथ-विल्वीवसुकवसिर-चित्रकश्तावरी-विख्वाजयहीदर्भा डहतीइयचेति ।

वद्यादिर्गणी श्वेष कफमेदोनिवारणः ।

विनिहन्ति शिरःश्वलं गुल्माभ्यन्तरविद्रधीन् ॥ ४

धेरतकसुहचरइयदभं - डहादनीगुद्धानलकुशकाशाश्मभेदकाग्रिमन्थभोरटावसुक-वसिरभल्ल ककुबृष्टकेन्द्रीयरकापेतवडाः चदंडु । चेति ।

बौरतव्यादिरियेष गणो वासविकारानुत् ।

चश्मरीश्वरमूवक्कच्छाधातरहज्ञपहः ५

सालसाराजकर्णखदिरकदरकास्त्रकन्धकामुकभूर्जमेष्टहीतिनिश्चन्दनकुचन्दनशिंश-पाशिरीचासनधवार्जुनतालकाशकनक्तमालपूतिकाशकर्णगुद्धणि कालीयकचेति ।

*Emetics : "Randia dumetorum, Wrightia antidysenterica, Andropogon serrata, Citrullus*

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सालसारादिरियेष गणः कुडविनाशनः ।

मेहपाण्डुमयहरः कफमेदोविशेषणः ॥ ६

रोगसावररोग, पलाशकुटब्रटाशीफझीकठ, फलेलावाहुकसद्धकीजिङ्गीकदम्-  
साखः कदची चेति ।

एष रोगादिरियुक्ती मेदःकफहरो गणः ।

योनिदोषहरः सधो ब्रह्मो विषविनाशनः ॥ ७

अकांक्षांकं-करञ्जाय-गागदन्तोमयूरक - भारीराजेन्द्रुपृथीचूदभेतामहाशेताहसि-  
कास्यलवण्याकापसहचर्चेति ।

अकांदिको गणो चोष कफमेदोविषापडः ।

क्रिमिकुष्ठप्रशमनो विशेषाट् व्रशशोधनः ॥ ८

सुरसान्तेसुरसाफणिजभकाञ्चे कम्भूषृष्टसुगम्भकमुमुखकालमालकासमई चवकखर-  
पुष्पाविष्टकाट् फलसुरसीनिर्गुरुलीलुलाहलोन्दुहकर्षि काफझीप्राचीबलकाकमाचो विष-  
मुट्ठिकर्षेति ।

सुरसादिर्गणो चोष कफहरू क्रिमिसूदनः ।

प्रतिश्वायाहसि वासकाह्नो व्रशशोधनः ॥ ९

सुक्षक-पलः-धव-चिवक-मदनघचक-शिंशपावज्ञालिफला चेति ।

हङ्कादिर्गणो चोष मेदोग्नः शुक्रदोषहरू ।

मेहार्घःपाण्डुरोगग्नः शर्कराशमरीनाशनः ॥ १०

पिष्पलौपिष्पलीमूलचव्यविवकश्चवैरमरिचहसिपि लोहरेणुवैकाजनोदिन्द्रयव-  
पाठाजीरकसर्वयमहानिष्ठ-फल-हिङ्गुभारीमुद्रुसातिविषावधाविष्टानि कटुरोहिणी-  
चेति ।

पिष्पसादिः कफहरः प्रतिश्वायाविलाहचरीः ।

गिहवाहीपणी गुण-यस्त्रव्यामधावनः ॥ ११

colocynthis, Luffa pentandra, Luffa amara,  
Sinapis alba, Embelia ribes, Piper longum,

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एलातगरकुडमासीधामकालवृपदनागपुर्जप-प्रियहृ-हरेणकाभ्याप्रगङ्घ-युक्तिवस्तासी-  
बेधकश्रीवेदक बीचचोरक बालक-गुणगुल-सर्वं रसतुरुक्ताकुट्टकाऽगुदस्पृष्ठोरभद्रदाह-  
तुरु माति पुश्चागकेशरस्ते ति ।

एलादिको वातकफो निह व्याइयमेव च ।

वर्षं प्रसादनः करु-पिङ्काकोठनाशनः ॥ १२

वचासुक्तातिविषाभयाभद्रदाहणि नागकेशरस्ते ति । हरिदादाहहरिद्राकालश्चोक्तज-  
बीजानि मधुकस्ते ति ।

एतो वचाहरिद्रादी गणो सन्विशेषनी ।

आमातीसारशमनो विशं शाहोषपात्रनो ॥ १३

श्यामामहाश्यामाविहृन्तोशङ्खिनो-तिशककन्पिष्ठकन्म्यकक्षसुकपुवश्च शो-नवार्ची-  
राजवस्त्र-करञ्जाहय-गुडूची-समलाञ्छगलान्वीमुधाः सुवर्णं चोरो चेति ।

उक्तः श्यामादिरित्येष गणो गुणविषापहः ।

आनाहोदरविष्ड-मेदी तथोदवर्त्तनाशनः ॥ १४

उक्तोकरुट्कारिकाकुट्टजफलपाठा मधुकस्ते ति ।

पाचनायो हल्लादिर्गणः पित्तानिलापहः ।

कफारोचकहल्लासूक्तक्षविनाशनः ॥ १५

पटोलाचन्दनकुचन्दनमूर्वांगुडूचीपाठाः कट रोहिणी चेति ।

पटोलादिर्गणः पित्त-कफारोचकनाशनः ।

ज्वरोपशमनो ब्रह्माञ्छहिंकरु विषापहः ॥ १६

काकोलीबीरकाकोलीजीवर्कवभक्षमुद्धयर्थे-माषपर्णीमिदामहामिदा-क्षिरदहा-कर्कीट-  
मधु-नुगाच्चोरी-पश्चक-प्रपीख्चरीकहि-हङ्कि-मृदीकाजीवनयो मधुकस्ते ति ।

काकोलीदिरियः पित्त-शोषितानिलानाशनः ।

जीवनी गृंहचो इष्वः सन्वद्वेष्टकरत्तवा ॥ १७

Pongamia glabra, Cassia tora, Bauhinia variegata, Cordia myxa, Melia azadrachta, Withania

जषकसैम्बशिलाजतुकासौसदयहिङ्गुनि तुल्यकर्षेति ।

जषकादिः कफं हन्ति, गणो मेदोविशेषणः ।

अग्नरीश्वरामूद-हृकृग्रामप्रशाशनः ॥ १८

सारिवामधुकचन्दनकुचन्दनपद्मकाश्मोरफल-मधुकपुष्पाणुशीरकर्षेति ।

सारिवादिः पिपासान्त्रो रक्तपित्तहरो गणः ।

पित्तज्वरप्रशमनो विशेषाहाहनाशनः ॥ १९

अग्नरसाञ्जनगुप्त्य-प्रियहु नीलोयलगलदनलिङ्गेश्वराचि मधुकर्षेति ।

अग्नादिर्गंधो स्ते ष रक्तपित्तनिवर्द्धणः ।

विशेषमनो दाहं निहन्त्याभ्यन्तं तथा ॥ २०

पक्षक-द्राक्ष-कट्फल-दाढ़िम-राजादमकतकफल-शाकफलानि विफला र्षेति ।

पक्षकादिरित्येष गणोऽनिलविनाशनः ।

मूवदोषहरो हृदयः पिपासान्त्रो रक्तप्रदः ॥ २१

प्रियहु समझाधातकीनागुप्त्यचन्दनकुचन्दनमोचरसरसाञ्ज-कुश्मीकसौतोऽज्ञनपद्म-  
केशरयोजनवस्त्रयो दीर्घदूला र्षेति ।

अग्नाधातकोक्तसुमस्त्राकट्टुमधुकविलपेशिकारोभ्रसावररोभ्रपलाशनन्दीहृचपत्त-  
केशरानि र्षेति ।

गणो प्रियहु लडादी पक्कातीसारानाशनौ ।

सम्बन्धीयो हितौ पित्ते व्रणानाच्चापि दीपणी ॥ २२

व्ययोधोऽन्वरात्यप्यवस्थुक-कपोतनकुभावकोशावचोरकपत्रज्ञवहयपिदालमधक-  
रोहिणीवस्त्रुलकादम्बदरोतिस्तुकोसङ्गकोरोभ्रसावररोभ्रभ्रातकपलाशा नदोहृषेति ।

व्ययाधादिर्गणो व्रषः संयाही भग्नसाधकः

रक्तपित्तहरो दाह-मेदोघ्नो योगिदोषहरः ॥ २३

somnifera, Rumex vesicarius, Pentapetes phœnicaea, Clitorea ternatea, Crotolaria verru-

गुडूचीनिवकुसुम्युक्तचन्दनानि पद्मकस्ते ति ।

एव सर्वज्वराण् इति गुडूचादिक्षु दीपनः ।

हल्लासारोचकच्छहिं-पिपासादाहनाशनः ॥ २४

उत्पलार नीत्यकुमुदसीगम्भिककुबलयपुष्टरोकाचि मधुकस्ते ति ।

उत्पलादित्यं दाह-पितरक्तविनाशनः ।

पिपासाविषहड्डीग-हहिंमूर्खाहरो गणः ॥ २५

मुक्ताहरिद्वादाहरिद्वाहरीतकामलाकविभीतक-कुहड्डेमवतो-बचापाठाकट रोहिषी  
शार्ङ्ग्यादातिविषाद्राविडीभल्लातकानि चिदकस्ते ति ।

एव मुक्तादिको नामा गणः श्वेतनिसूदनः ।

योनिदीषहरः सत्य-शोधनः पाचनसाधा ॥ २६

हर्तोतकथामलकविभ-तकानीति विफला ।

विफला तु विदोषही मेहकुष्ठविनाशनी ।

चतुर्था दोपनी चेव विषमज्वरगाम्यनी ॥ २७

पिपलीमरिचभङ्गवेताणीति विकट-कम् ।

दूषणं कफमेदोन्नं मेहकुष्ठलगामयान् ।

निष्वाहीपनं गुञ्ज-पीमसाम्बव्यप्तामपि ॥ २८

आमलकी-हरितकी-पिपल्यसिद्धकस्ते ति ।

आमलकादित्येष गणः सर्वज्वरापहः ।

चतुर्थो दीपनी गणः कफारोचकनाशनः ॥ २९

वपुलीसदामरजतक्षलोहमूर्खानि लोहमलस्ते ति ।

गणस्त्रशादिरित्येष गरक्षिभिहरः परः ।

पिपासाविषहड्डीग-पाञ्च मेहहरसाधा ॥ ३०

खाचारितकुटजाशमारकट-फलहरिद्वाहयनिवसप्तक्षदमालत्यक्षायनाशा चेति ।

cosa, Coccinea indica, Acorus calamus, Pyrotheca lagenaria and Plumbago zeylanica are emetics. And of them, fruits are to be used of the plants mentioned above up to Cassia tora, and from Crodia myxa roots are to be employed.

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कषायतिक्तमधुरः कफपित्तानिवाशनः ।

कुष्ठक्रिमिहरये च दुष्टब्रणविशेषं ॥ ३१

पच पञ्चमूलान्यत ऊर्जा वचामः । तत विकस्तकडहतीइयपथक्पर्णो विदारि-  
वशा चेति कनीयः ।

कषायतिक्तमधुरं कनीयः पञ्चमूलकम् ।

वातज्ञं पित्तश्वमं दृष्ट्य वलवर्द्धनम् ॥ ३२

विलाग्निमन्थटुरुक्तपाटलाकाशमर्थं चेति महत् ।

सतिक्तं कफवातज्ञं पाके लघुग्रिहीपनम् ।

मधुरागुरसच्चे च पञ्चमूलं महत् अृतम् ॥ ३३

अग्नदोदयमूलमुच्चते ।

जथः शासहरी स्त्री च कफपित्तानिवाशनः ।

आमस्य पाचनस्ये च सर्वज्वरविनाशनः ॥ ३४

विदारीसारिवारजनीगुज्जोऽजश्वी चेति वहीसंशः ।

करमह्व त्रिकश्टकश्टरीयकशतावरीगृध्रनख्य इति कश्टकर्णशः ॥

रक्तपित्तहरी स्त्री ती शीफत्यविनाशनी ।

सर्वमीहरी चैव शुकदोषविनाशनी ॥ ३५

कुष्ठकाशनखदर्भकाश्चेत्काङ्क्षिति वृणसंशकः ।

सूत्रदोषविकारस्त्र रक्तपित्त तथैव च ।

जथः प्रयुक्तः चोरेच शीम्रमिव विनाशयेत् ॥ ३६

सुहृतसंहिता, उत्तराशनम्, १८ ।

*Purgatives* : *Ipomoea turpethum*, *Ipomoea nil*, *Baliospermum montanum*, *Salvinia cucullata*, *Jasminum sambac*, *Andropogon acicularis*, *Gymnema sylvestre*, *Lagenaria vulgaris*, *Argyreia speciosa*, *Euphorbia neriifolia*, *Cleome felina*, *Plumbago zeylanica*, *Achyranthes aspera*, *Poa cynosuroides*, *Saccharum spontaneum*, *Symplocos racemosa*, *Mallotus philippensis*, *Trichosanthes dioica*, *Stereospermum suaveolens*, *Areca catechu*, *Terminalia chebula*, *Phyllanthus emblica*, *Terminalia belerica*, *Indigofera tinctoria*, *Cassia fistula*, *Ricinus communis*, *Guilandina bonducella*, *Euphorbia neriifolia*, *Alstonia scholaris*, *Calotropis gigantea* and *Cardiospermum halicacabum* are purgatives. And of them roots should be used of the plants up to *Saccharum spontaneum*, the bark from *symplocos racemosa* to *stereospermum suaveolens*, the pigmented granules of the fruit of *mallotus philippensis*, the fruits from *Areca catechu* to *Ricinus communis*, the leaves of *Guilandina bonducella* and *Calotropis gigantica*, and the gum-resins ( milky exudations ) of the rest.

*Emetics and purgatives* : *Luffa amara*, *Stereospermum suaveolens*, *Andropogon acicularis*, *Luffa pentandra*, and *Memordica Charantica* are emetics and purgatives combined.

*Errhines* : *Piper longum*, *Embelia ribes*, *Achyranthes aspera*, *Moringa pterygosperma*, *Sinapis alba*, *Albizzia lebbek*, *Piper nigrum*, *Nerium odorum*, *Coccinea indica*, *Clitorea ternatea*, *Achyranthes fruticosa*, *Acorus calamus*, *Cardiospermum halicacabum*, *Pongamia glabra*, *Calotropis gigantea*, *Calotropis procera*, *Allium sativum*, *Aconitum heterophyllum*, *Zingiber officinale*, *Pinus webbiana*, *Garcinia xanthochymus*, *Ocimum sanctum*, *Ocimum album*, *Balanites roxburghii*, *Gymnema sylvestre*, *Citrus medica*, *Salvadora oleoides*, *Salvadora persica*, *Jasminum grandiflorum*, *Shorea robusta*, *Borassus flabelliformis*, *Bassia latifolia*, *lac*, *assafœtida*, *sodium chloride*, *wine*, *cow's urine* and *extract of cow's dung (ammonium)* are errhines. Of these fruits should be taken from *Piper longum* to *Piper nigrum*, roots from *Nerium odorum*, bulbs from *Allium sativum* to *Zingiber officinale*, leaves from *Pinus webbiana* to *Ocimum album*, the bark from *Balanites roxburghiana* to *Gymnema sylvestre*, the flowers of the next three plants and the extracts of the following next three ; *lac* and *assfoetida* are resinous exudates, *sodium chloride* an earthly matter ( mineral substance ), and the *cow's*

urine and the dung are excretory products." *Susruta I.* 39. 2-5<sup>100</sup>.

*Saccharine drugs* : The *Asclepias* (the *kākoli* group, *Susruta I.* 38. 17 led by *Gymnema balsamicum*), milk, butter, fat, bone-marrow, *Oryza sativa*, *Oryza praecox*, *Hordeum hexa-*

188. मदनकुटजीमूतकेस्ताकुधामार्गदहतवेधसर्वपिङ्गलिकरक्षप्र-  
पुष्टाकोविदारकर्व्युदारारिष्टाशग्न्याविदुलवन्मृजीवकन्तेताश्पुष्टवी-विली-वचावीर्वाद-  
चित्राचे त्यूँ भागहराणि । ततु कोविदारपूर्वाणा फलाणि । कोविदारादीना  
मूलाणि ॥ २

त्रिडता-श्यामा-दन्ती-द्रवती-सप्तला-शङ्खिनी-विजाणिका-गवाची-चण्डालाकीमुक्त-  
मुवर्षचीरीचित्रककिञ्चिह्निकाशतिलककम्पिङ्गक-रम्यक-पाटला-युग-इरितक्यामलक-  
विभेतकनीलिनी-चतुरक्षुलेरक्ष-पूतोकमहाहक्षसतक्षदाक्ष्योतिषतो चेत्यधीभाग-  
हराणि । ततु तिलकपूर्वाणा मूलाणि । तिलकादीना पाटलाळाणा त्वचः ।  
कम्पिङ्गकफलरजः । पूगादीनामिरखाळाणा फलाणि । पूतोक-रग्बधयोः पत्राणि ।  
शेषाणा चीराणीति ॥ ३

कोशातकी सप्तला शङ्खिनी देवदालो कारवेलिका चेत्युभयतोभागहराणि । एवा  
स्वरसा इति ॥ ४

पिप्पली-विङ्गापामार्गशिपुसिद्धार्थकशिरोषमरिचकरबी-विलीगिरिकचिं काकिणिही-  
वचा-ज्योतिषतो- करञ्जाकार्कालंसग्नातिविषाघङ्गवेर- तालीश-तमालमुरसार्जकेङ्गुदीमिष-  
शङ्खीमातुलुहीमुक्ताणी-योलुजाती-शाल-ताल-मधूक - लालाङ्गुलवण्यमद्यगोथकाङ्गदसमूत्रा-  
णीति शिरोविरेचनाणि । ततु करवोरपूर्वाणा कन्दाः । तालीशादीनामर्जकाळाणा पत्राणि ।  
नामकाळाणा मूलाणि । तालीशपूर्वाणा कन्दाः । तालीशादीनामर्जकाळाणा पत्राणि ।  
इङ्गुदीमिषघङ्गोत्वची । मातुलुहीमुक्ताणीयोलुजातीना पुष्टाणि । शालतालमधूकाणा  
साराः । हिङ्गाचे निर्यासी । लवणाणि पार्दिविशेषाः । मदाम्बासवस्थीगाः ।  
गोमूलशङ्खाङ्गदसो भजातिति ॥ ५

सुहृतसंहिता, सतुराजनम्, १८-६

*stichon*, *Triticum aestivum*, *phaseolus radiatus*, *fructus Trapa bispinosa*, *Scrypus kysoor*, *Cucumis sativus*, *Cucumis melo*, *Cucumis anguinus*, *Lagenaria vulgaris*, *Cucumis utilismus*, *Strychnos potatorum*, *Citrus aurantium*, *Buchanania latifolia*, *Nelumbium speciosum*, *Gmelina arborea*, *Bassia latifolia*, *Vitis vinifera*, *Phoenix sylvestris*, *Mimusops indica*, *Borassus flabelliformi*, *Cocos nucifera*, *Saccharum officinarum*, *Sida cordifolia*, *Mucuna pruriens*, *Batatas paniculata*, *Oxystelma esculentum*, *Tribulus terrestris*, *Sansevieria zeylanica*, *Foenicum vulgare* and *Cucurbita pepo* contain saccharine substances.

*Acids* : *Punica granata*, *Phyllanthus emblica*, *Citrus medica*, *Spondias mangifera*, *Feronia elephantum*, *Carissa carondas*, *Peucedanum sowa*, *Zizyphus jujuba*, *Tamarindus indicus*, *Mangifera salvatica*, *Diospyros embryosterus*, *fructus Calamus rotang*, *Artocarpus lakucha*, *Rumex vesicarius*, *Citrus bergamia*, curdled milk (lactic acid content), whey, sour wine, sour gruel, fermented rice and barley water and other acetous fermentation products belong to the acid group.

*Salines* : Rock-salt, carbonate of lime (from incinerated shells and the salt is recovered by lixiviation), soda, potash, 'raumaka' (salt made

from the water of the Roma lake, now known as Sambar ), sea-salt, 'pakrima' ( salt obtained from the ashes of the grain spikes of barley ), caustic soda, magnesia, alkaline earth ( containing sodium carbonate ) etc. belong to the saline class.

*Pungents* : Piperaceæ ( led by *Piper longum* of the 'pippali' group I. 38. 10 ), the *Ocimum* group ( I. 38. 8. ), *vitex negundo*, *Moringa pterygosperma*, *Allium sativum*, *Cinnamomum camphora*, *Datura fastuosa*, *Cedrus deodara*, *Piper auranticum*, *Vernonia anthelminthica*, *Canscora decussata*, *Balsamodendron mukula*, *Cyperus rotundus*, *Gloriosa superba*, *Calosanthes indica*, *Sesbania grandiflora*, *Salvadora persica*, etc. and the gum-resins of the *Shorea robusta* group ( I. 38. 5 ) are pungent.

*Bitters* : The *Cassia fistula* ( I. 38. 3 ) and *Tinospora cordifolia* ( I. 38. 24 ) groups, and *Hydrocotyle asiatica*, tops of *Calamus rotang*, *Curcuma longa*, *Berberis asiatica*, *Holarhena antidysenterica*, *Capparis trifolia*, *Flacourtie cataphracta*, *Alstonia scholaris*, *Solanum indicum*, *Solanum xanthocarpum*, *Canscora decussata*, *Salvinia cucullata*, *Ipomoea turpethum*, *Luffa amara*, *Momordica myxta*, *solanum melongena*, *Capparis aphylla*, *Nerium odoratum*, *Jasminum*

*grandiflorum*, *Andropogon acicularis*, *Achyranthes aspera*, *Ficus heterophyllum*, *Saraca indica*, *Herpestis monieri*, *Boerhaavia diffusa*, *Tragia involucrata*, and *Cardiospermum halicacabum*—are bitter.

*Astringents* : The groups led by *Ficus bengalensis* ( I. 38. 23 ), *Aglaia roxburghiana* ( I. 38. 21 ), *Staphania hernandifolia* ( I. 38. 22 ), *Symplocos racemosa*, *Terminalia chebula*, *Terminalia belerica*, *Phyllanthus embelica*, *Boswellia serrata*, *Eugenia jambu*, *Mangifera indica*, *Mimusops elengi*, *Diospyros embropteris*, *Strychnos potatorum*, *Stereospermum suaveolens*, *Barleria cristata*, *Bauhinia variegata*, *Caelegyne ovalis*, *Symplocos racemosa*, *Beta maritima*, *Marsilia quadrifolia* etc., *Oryza montana* etc., *Phaseolus mungo* etc., these in brief belong to the astringent class. “*Susruta* I. 12. 15-20”.

*Alkalies* : Alkalies are obtained from the ashes

189. तद्यथा—काकोल्यादि: शीर-चृत-वसा-मज्जा-शालि-यटिक-यव-गोधूम-माषशङ्खाटककसेहकवपुसे व्यादकालावुकालाहतकाइलीयपियालपुष्करबोजकाशमर्थमधु-कद्राशाखम्बुरराजादनतालनारिकेलेचुविकारवलातिवलाकमगुसाविदारी-पयस्यागोचुरकचो-रमोरठ मधुलिकाकुमाण्डप्रस्तरोनि समासिन मधुरो वर्गः ॥ १५

दाढिमाभाजकमातुलुड्हाभातककपित्यकरमह्वदरकोलप्राचीनामलक-तिलिङोक-कोशाबभवपारावतवेवफललकुचाहवेतसदनशठ-दधि तक्ष-सुराशुक्रसीबीरुषीदक्षाभान्ना-क्षप्रभृतीनि उमासिनाह्वो वर्गः ॥ १६

of the following plants. "Holarrhena antidysenterica, Butea frondosa, Shorea robusta, Erythrina fulgens, Terminalia belerica, Cassia fistula, Symplocos racemosa, Asclezia gigantea, Euphorbia antiquorum, Achyranthes aspera, Bignonia suaveolens, Methonica superba, Justicia ganderussa, Musa paradisiaca, Plumbago zeylanica, Guilandina bonducella, Jasminum augustifolium, Nerium odorum, Alstonia scholaris, Premna spinosa, Abrus precatorius and Trichosanthes dioeco." *Susruta* I. 11. 7<sup>100</sup>.

सं भवसीवर्ष्णस-विहयाक्षरोमकस। मुद्रकपक्षिमयवच्छारोषप्रसूतसवर्षिकाप्रभृतीनि समासेन लक्षणो वर्णः ॥ १७

पिप्पल्यादिः सुरसादिः शियु नधुशियु मूलकलगृहनसूखवशीतयिवकुठटेवदाष्ट-हरेष्टकावल्लुग्गलवच्छागुग्गु-सु-मुक्ताङ्गलकीश्वकनासायोलुप्रभृतीनि सालसारादिश्च प्रायशः कटुको वर्णः ॥ १८

आरवधादिग्गु-कूच्छादिर्घ्यक्षुकपर्णीविवकारी-हरिद्राइयेन्द्रयववहस्तादुकारुक्तसपर्व-इहतीवय-शक्तिनी-द्रवकीविहत-कृतवेधनकर्त्तिकारवैश्वकवार्ताक-करीर-कर्वांर-सुमग्नः गङ्गपुष्पयामार्गावायमाचाष्टोकरोहिणीवैजयन्ती सवर्षापुनर्वाहिचिकालीज्योतिभृती-भृतीनि समासेन तिक्तो वर्णः ॥ १९

व्योधादिर्घ्यक्षुदी रोगादिस्तिफला शहकीज्यवृत्तुतिन्दुकफलानि कासकाशकफलापाषाढमेदकवलस्पतिफलानि सालसारादिश्च, प्रायशः, कुदवककीविदारक-जीवकीचिह्नापालद्यामुनिवच्छकप्रभृतीनि जीवारकादयो सुझादयो वैदलाच लमासेन काशयो वर्णः ॥ २०

सञ्चुतसंहिता, सूतस्थानम्, ४६ ।

190. अथानेव विधानेन कुट्टपलाशाश्वकर्ण्यारिभीद्रकविभातकारउधतिल्ल-कार्बुच्छामार्ग-पाटला-जङ्गमाला-हृषकदलीचित्रकपूतीकिञ्चचाल्कोतामारकासम्बद्धा-चिन्मन्यगुच्छाचतुर्भवीवितकोः समूलफलपत्रशाखा दहित् ॥ २१

सञ्चुतसंहिता, सूतस्थानम्, ११ ।

*Antiparasital Oils* : "The oils of Azadirachta indica, Linum usitatissimum, Carthamus tinctorius, Raphanus sativus, Andropogon serrata, Holarrhena antidysenterica, Luffa amara, Calotropis gigantea, Mallotus philippensis, Butea frondosa, Elettaria cardamomum, Salvadorae persica, Pongamia glabra, Balanites roxburghii, Moringa pterygospermum, Sinapis alba, Cleome viscosa, Embelia ribes and Cardiospermum halicacabum are acrid, irritant, pungent and they are beneficial in 'vāyu, kapha', parasital ( or intestinal worms ), or syphilitic skin lesions and headache." *Susruta I. 45. 101<sup>191</sup>*.

*Diuretic and laxative oils* : "The oils of Ophelia chirayta, Eugenia dalbergioides, Terminalia belerica, Cocos nucifera, Zizyphus jujuba, Salvadorae persica, Cælagyne ovalis, Buchanania latifolia, Bauhinia variegata, Gynandropsis pentaphylla, Cucumis sativus, Cucumis melo, Cucurbita pepo, and Benicassa cerifera are sweetish, sedative, non-irritant, diffusive, laxative, diuretic and dyspeptic.

191. निवासतो-ज्ञानम्-मूलक-जीमूतक-इच्छातवेदनार्ककपिहकाइसिकर्ण-  
शृणुकायीलु-कारजे शुद्धीशिष्यु सर्व प्रसुवर्षलायिकङ्गव्योतिभंतीफलतैकाणि तीजाणि लष-  
म्बुच्चीर्णाणि कट्टनि कट्टुविपाकाणि सराय्यनिलक्षपह्नमिन्नुहप्रभैडिग्निरीटीग्निराचि-  
चेति ॥ १०१

The oils of *Bassia latifolia*, *Gmelina arborea* and *Butea frondosa* are sweetish astringent and they remove the excess of 'kapha' and 'pitta'.

*Bactericidal emetics and purgatives* : The oils of *Hydrocarpus kurzii* (*tuvara* is popularly known as '*chaulmoogra*' ), and *Semicarpus anacardium* are of astringent sweetish bitter taste, are calorific, emetic, purgative and bactericidal, and are specific in leprosy, adiposis and syphilis ( syphilitic cutaneous manifestations ).

*Oxidizing oils* : The oils of turpentine obtained from oleoresins ( by distillation ) of *Pinus longifolia*, *Cedrus deodara*, *Tithymallus antiquorum* (?), *Dalbergia sissoo* and *Aquilaria agallocha* are of astringent bitterish pungent taste and are beneficial in indolent ulcers, intestinal worms, catarrhal affection ( of the respiratory tract ) and scrofula.

*Antiseptic Oils* : The fruit-oils of *Lagenaria vulgaris*, *Mangifera sylvetica*, *Baliospermum montanum*, *Salvinia cucullata*, *Vernonia anthelmintica*, *Stereospermum suaveolens*, *Vitex negundo*, *Mallatus philippensis* and *Andropogon aciculatus* are of bitterish-pungent astringent taste, are purgative and are beneficial in intesti-

nal worms, skin lesions and indolent ulcers." *Susruta I.* 45. 106-110<sup>192</sup>.

The therapeutic value of these drugs is also significant. Many of them are of unquestioned effectiveness in the symptomatic treatment of the diseases for which they have been described. It is not possible here to go into details as to the chemical principles contained in them, for it will not only encumber the book with an extraneous subject, but many of them have not yet been analyzed in a modern laboratory. However, in the popular pragmatic test, they have shown their fitness of survival in competition with the foreign drugs which unmistakably demonstrates

192. किराततिक्षकाऽविमुक्तक-विभीतक-नारिकेर-कोलाचोडीबन्तो-पियाळ-  
कर्म्मुदार-सूर्यवज्ञी-वपुसैर्व्याहक-काराद-कुचारुप्रभृतीना तेलानि नधुराणि मधुरकीर्य-  
विपक्वानि बातपित्तप्रशमनानि श्रीतबीर्याप्स्त्रभिष्ठन्दोनि सूष्टविषमूदार्घापित्तादनानि  
चेति ॥ १०६

मधूकका। इर्यापत्तेलानि मधुरकवायाणि कफपित्तप्रशमनानि ॥ १०७

तुवरकमङ्गलकतेले उच्चे मधुरकवायि तिक्षातुरसे बातकफकुण्डनेदोनिइक्किमिहरे  
उभयतोभागदोषहरे च ॥ १०८

सरलदेवदार-गुणार-विश्वपागुदसारके हासिक-कटु-कवाया दुष्टव्यवोधनाः क्रिमि-  
कफकुण्डानिषहराय ॥ १०९

तुम्बोकोशावदनोद्वन्द्वोप्यामासमलानीलिकाकम्पिङ्गकशङ्किनोचे हासिककटु-कवाया  
अधोभागदोषहराः क्रिमिकफकुण्डानिषहरा दुष्टव्यवोधनाय ॥ ११०

सुहुतस्त्विता, सत्रुस्थानम्, ४५।

their therapeutic worth.\* Opotherapy was known in its crude form (*Charaka* I. 1. 35). Of course it is too much to expect that it was known that the activating principles of the glands—the hormones, were not destroyed by gastric digestion or boiling at ordinary temperature, or they knew to extract chemically pure thyroidin, adrenalin, paracreatin or spermin, but they prescribed, never-the-less the testicles of goat and cock as potent aphrodisiac (*Charaka* VII. 2. 13.<sup>103</sup>; VII. 2. 28. <sup>104</sup>). It is very

\* Those who are further interested in the subject, will find in '*A Comparative Hindu Materia Medica*' which is under preparation, and which contains their synonyms, expressions in the vernacular provincial dialects, Arabic, Persian, Latin, Greek, English, French and German, their botanical order and classification, chemical analysis when known and their popular therapeutic uses, as well of the allied genera in other countries.

193. ईषत् सलवयः युक्तं धार्वजीरकानागरैः ।

एष हयय वस्यय हृष्णय रसोत्तमः ॥

चरकसंहिता, चिकित्सालक्षण्यम्, २ ।

194. तप्ते सर्पि वि नक्ताण्डं ताष्व छाष्टमिश्वितम् ।

युक्तं वट्टिकाण्डं न सर्पि वाभिमवेन च ॥

पद्मा पूपलिकाः खादिशाहीनक्षापो नरः ।

य इष्टेदवश्वहन्तुं प्रसिद्धं गतवद्य यः ॥

चरकसंहिता, चिकित्सालक्षण्यम्, २ ।

likely that the biliary calculus (*rochanā*) was given in intestinal putrefaction, in case of insufficiency of biliary salts, and the cow's urine was used in cooking the alkalies in order to add the ammonium to the alkalies to make them more caustic (*Susruta* I. 11. 6), and the dessicated cow's dung was either used as a fuel for cautery or as heat-absorbent in which some liquid preparations were kept for ripening.

## VII. SURGERY.

"There are eight kinds of surgical operations, namely, excision (*chhedyā*), incision (*bhedya*), scarification (*lekhya*), puncturing (*vedya*), exploration (*esya*), extraction (*āhārya*), drainage (*visrāvya*) and suturation (*sivya*). For any of these operations, the surgeon must have the following materials ready at hand and at his disposal, namely the blunt surgical instruments (*yantra*), sharp instruments (*śastra*), caustics (*kṣāra*), cautery (*agni*), probes (*śalākā*), speculum (*śringa*), bottle-gourd (*alāvū*), bougie (*jāmvavauṣṭha*), cotton (*pichu*), pad or lint (*plota*), silkworm gut (*sūtra*), sponge (*patra*=leaf ?), bandage (*paṭṭa*), honey, clarified butter, fat, milk, oils, irrigator (*tarpana*), disinfectants (*kaṣāya*), liniments (*ālepana*), paste or ointment (*kalka*) and other auxiliary requisites." *Suśruta* I. 5. 3 <sup>195</sup>.

195. तथ यस्कर्मादविधम् । तद्यथा—चेद्यं भेद्यं स्लिष्टं विश्लेष्यमाहाये विकायं सोन्यनिति । अतोऽन्यतमं कर्म चिकीर्षता वदेन पूर्वमिवोपकरणवित्यानि भवति—तद्यथा यस्कर्मस्वचाराप्रियत्वाकाश्वजलीकालादुजाम्बवोषिष्ठोतस्तपदपद्म-मधुत्पत्तवसापयसीखतपर्यक्तायालिपन्-कस्ययजनशोदोषोदककटाहादीनि परिकर्मिण्यकृ-किञ्चाः स्विरा वलवतः ॥ ३ ॥

सूक्ष्मतस्त्विता, द्रुक्षानम्, ५ ।

"There are one hundred and one kinds of blunt instruments (*yantra*), of which the hand is the most important, for the hand controls the application of all the (surgical) instruments and without it (an adept hand), they can not be manipulated. Whatever (foreign body) causes pain to the body and the mind, is called '*salya*' and the instruments that are necessary to extract the '*salyas*' are called '*yantras*'. *Yantras* are of six kinds, namely (1) Cruciform forceps (*svastika yantra*), (2) pincer-like forceps (*sandaṁśa yantra*), (3) pick-lock forceps (*tāla yantra*), (4) cannula (*nādi yantra*), (5) probes (*śalākā yantra*) and (6) accessory appliances (*upayantra*). Of them the cruciform forceps are of forty kinds, pincer-like forceps of twenty kinds, pick-lock forceps two kinds, cannulata twenty kinds, probes twenty-eights kinds and accessory appliances are of twenty-five kinds. They are usually made of (steel) iron, but, (if it be not available, they can be also made) of similar (hard) metal. Their blades are shaped like those of the carnivorous animals, deer, or birds. Therefore likewise they should be manufactured, or according to the rules in the surgical text-books, or according to the instruction of an expert of surgical instruments. They should be of normal size, and according

to the needs, either with sharp edges or with polished curbed ends, of firm structure, pleasant appearance and with a good handle.

*Swastika Forceps* :—The swastika forceps should be eighteen fingers' breadth long (about 12 inches) and their blades shaped like the jaws of a lion (*simha* : 1. Ferguson's lion-jaw bone-holding forceps—*osteophore*—with strong blades and teeth to crush and divide bone) ; tiger (*vyāghra* : 2. A bone-gnawing forceps with double-jointed, short, concave blades, having sharpened edges) ; wolf (*vrka* : 3. Ferguson's bone-holding forceps, having long, strong handles, and short, straight or curved jaws serrated on their internal faces) ; hyena (*tarakṣu* : 4. Farabeuf's forceps with strong grasping teeth all along the inner surface of each blade) ; bear (*bhalluka* : 5. Bulldog forceps with sliding catch, concave, expanded and fenestrated extremities and at the tips, fine teeth) ; panther (*dvipi* : 6. Gross's bullet forceps with one blade hooked and the other fenestrated and toothed) ; cat (*mārjāra* : 7. Mouse-tooth forceps, with one or two fine points at the tip of each blade, fitting into hollows between the points on the opposite side) ; jackal (*śrgāla* : 8. Bone forceps, used for seizing and tearing away fragments of bone) ; deer (*harīṇa* ;

9. Bedford's obstetric forceps, short-handled, movable-jointed and having long, curved, fene-strated blades) ; stag (*ervvāruka* ; 10. Bullet-forceps, single-jointed, having long delicate blades, the tips being expanded and concave on their internal side to correspond to the spherical shape of the bullet, or the tips are hooked, so that they may be forced into the bullet) ; crow (*kāka*), heron (*kaska*), osprey (*kurara*), golden jay (*chasa*), vulture (*bhāsa*), hawk (*sasaghāti*), owl (*lūka*), kite (*chilli*), black vulture (*syena*), falcon (*grdhra*), crane (*krauñcha*), 'vrñgarāja, *añjali-karṇa*, *avabhañjana*, *nandimukha*' etc. (Dental forceps, double-jointed, having long handles of various curves, and short jaws set at various angles and shapes to hold and extract different teeth in the upper and the lower jaw, resembling the beak of birds). The blades ( of the *swastika* forceps ) should be joined by a lentil-like (Ervum lens) joint, and the handles should be curved like the elephant-driver's hook. The '*swastika* forceps' are used in extracting foreign bodies impacted in bones ( foreign bodies were usually sharp-pointed iron-arrows, used in ancient Indian warfare, and though the comparative forceps, mentioned above, may be similar, they can not be the same, as it needed different kinds

of forceps to extract sharp-pointed, possibly thin-plated steel-arrows, impacted in bones ; the comparison has only been made to give an idea of the similarity of the construction of the forceps, used in ancient and modern surgery ).

*Pincer-like Forceps* : The pincer-like forceps (*sandamśa yantra*) are of two kinds, jointed and with sliding catch-spring. They should be 16 fingers' breadth long (about 10 inches) and they are used in extracting foreign bodies in the skin, tissues, vessels and nerves (*sirā*) and tendons.

*Pick-lock Forceps* : Pick-lock forceps should be made 12 fingers' breadth long (about 8 inches), like the jaw of fish (dolphin), serrated either on one blade or both the blades and they are used in extracting foreign bodies from the aural and nasal passages (Alligator forceps, having delicate, straight or curved wide-opening jaws, for use in narrow canals).

*Tubular instruments* : Tubular instruments (*nāḍī yantra*) are many and they serve various purposes. Some of them have opening at one end, and others at both ends (or some are single-barrelled, and others are double-barrelled). They are used for the extraction of foreign bodies from vessels (Tubular forceps, with long and

slender blades, intended for use through a cannula or other tubular instrument), for the exploration of (internal) lesions (*Bougie*, a cylindrical instrument, resembling a Sound, usually more or less flexible and yielding, and which is employed in the diagnosis and treatment of stricture of tubular passages, such as the urethra or the rectum; *Probe*, a slender rod of silver or other flexible metal, with blunt bulbous tip, and which is used for exploring sinuses, fistulas or other cavities; *Sound*, an elongated, cylindrical, usually curved instrument of metal and which is used for exploring the bladder or other cavities of the body, or for dilating strictures of the urethra or other canal; with the general use of electricity, many devices have been perfected, by introducing a tiny incandescent bulb at the end of the tube and a reflector at the top, which projects the exact condition of the internal organs as larynx, pharynx or urethra, through laryngoscope, pharyngoscope and urethroscope), for suction of fluids (as *Catheter*, for draining away urine from the bladder, in case of its retention from any cause; or *Trocar* for withdrawing fluid from any cavity, as in hydrocele), and for facilities for other operations (as Director in lithotomy). The

breadth and the length of the tubular instrument should harmonize with the narrow canal ( in which it is to be used ). The tubular instruments that are used in fistula-in-ano, gummata, tumors, abscesses, for injection, irrigation, in hydrocele, ascites, for fumigation, in stricture of urethra, and stricture of the rectum, and other instruments such as '*alāvu yantra*' ( -bottle-gourd ? ) and speculum will be mentioned later.

*Probes* : The probes (*śalākā yantra*) have various uses ; their dimension and their length are dependent on their requirements. They have their ends shaped like an earthworm, the feathered part of an arrow, the hood of a snake, or a fish-hook, and there are two varieties of each kind. They are used for exploration (*esana*, such as Bougie, probe or sound ), retraction (*vyūhana*, as by a Retractor ), grafting (*chālana*) and extraction (*āharana*, by a tubular forceps ). For extraction of foreign bodies from vessels, two *śalākā* forceps ( Haemostatic forceps ) are used, whose ends are slightly flattened like those of a lentil ( Ervum lens ). Six are used for the drainage of pus having ends covered with cotton. For the application of caustics, three kinds are used whose ends are shaped like a spoon with a conical cavity. For cautery six kinds are used of which

the orifice is shaped like the fruit of Eugenia jambolana, and the other like that of the elephant-driver's goad. For the removal of the nasal polypi, one kind is used whose orifice is shaped like half the stone of Ziziphus jujuba, of conical formation with sharp edges (Meyer's ring knife or Luc's forceps). One kind is used for the application of ointment (in the narrow aural or nasal passages) whose both extremities are shaped like a pea or a flowering-bud (as in Tilley's Burr). For the urethral passage one kind is used whose circumference is like the flower-stalk of Jasminum grandiflorum.

*Accessory Appliances* :—The accessory appliances are thread, twine, bandage, skin-gloves, (*charmmānta*), birch-skin (*valkala* = bark), (tendril of) creeper (for gently dislocating foreign bodies from delicate sensitive organs or abscess cavities), lint, a large rounded stone, hammer (for loosening foreign bodies impacted in bone), the palm of the hand, the sole of the foot, finger, tongue, tooth, nail, mouth (for suction of the fluid as in ascites), hair, horse-hair (for suturation), a branch (of a tree, for extracting foreign bodies, from superficial wounds), expectoration, fluxing (causing discharge in the eyes or throat to remove foreign bodies), cheer-

fulness, loadstones ( used for finding out whether there are iron fragments in the wounds, as loadstones possess polarity and are attracted by iron ), caustics, cautery and medicines ( including disinfectants ).

These instruments can be applied all over the body, any of the limbs, joints, viscera and vessels ( including nerves ).

Extraction ( of foreign bodies with pulling : *nirghātana* ), injection (of disinfectants in the bladder or enema in the rectum, *pūrana*) : bandaging ( *vandhana* ); retraction (of the lips of the wound by a 'Retractor' for inspection, extraction of the foreign body and disinfection, (*vyūhana*) : replacement ( of the lips of the wound in their proper place : *varttana* ), grafting (principally cutaneous, to cover the wounded scar : *Chālana* ), wrenching ( of a foreign body, with a forceps to facilitate its extraction : *vivarttana* ), dilatation (of any canal or cavity by a 'speculum' for exploration : *vivarana* ), pressing ( of the wounded parts to loosen the foreign body, or for the drainage of the pus, if suppuration has taken place : *pīdana* ), disinfection ( of the wound, canal or cavity : *viśodhana* ), extraction ( with force : *vikarṣaṇa* ), pulling out ( *āharana* ), pulling gently to and fro ( to loosen the foreign body : *āñchhana* ), elevation ( of the

foreign body, in order to loosen it : *unnamana* ), depression ( of the fereign body : *vinamana* ), pressure ( by manipulation of neighboring tissues : *bhañjana* ), suction ( by a tube of the fluids, as in hydrocele or ascites : *āchūṣana* ) exploration ( of canal or sinus : *eṣana* ), splitting up ( a foregn body, to facilitate its removal : *dārana* ), straightening ( of the foreign body, in order to loosen it : *rjukarana* ), irrigation (of the wound with an 'Irrigator' : *prakṣālana* ), blowing disinfectant powders, vulneraries or errhines to deep-seated wound, narrow canal or nasal passage : *pradhamana* ), and rubbing ( with hair-brush any wound cavity : *pramārjjana* )—these twenty-four are the uses of the 'yantra' ( blunt instruments ).

As the foreign bodies can be of infinite varieties, so a wise surgeon must intelligently choose his instrument for each individual case.

*Defects in Instruments* : Too cumbersome or light, long or short appliances, the blades lacking the power of grasping, or grasping it badly, bent, shaky, too-high-jointed or loose-jointed, loose-bladed or loose-tipped appliances are the twelve defects in 'yantra' ( blunt instruments ).

The instrument' that is free from these defects, and which is eighteen fingers' breadth long,

is the only proper one, which the surgeon must select in surgical operations. The surgeon shall extract, according to the surgical code, the visible missile (*salya*) by the 'Lion-jaw forceps' and the invisible missiles by '*kaṅka-mukha*' (*heron-beaked forceps* = dental forceps).

Among the 'yantras', '*heron-beaked forceps*' is the best, as it can be easily introduced everywhere, and easily withdrawn with the extracted missile'. *Susruta* I. 7. 2-18<sup>196</sup>.

196. यन्वशतमेकोरमद इक्षमेव प्रधानतमः यन्वाणामवगच्छ । यस्माद्दक्षाढते यन्वाणामप्रहतिरेव तद्वीनलाद् यन्वकर्मणाम् ॥ १

तत्र मनःशरीरावाधकराणि शलाणि, तेषामाहरणोपादो यन्वाणि । तानि षट् - प्रकाराणि । तद्यथा, स्वस्तिकयन्वाणि । सन्दृश-यन्वाणि । तालयन्वाणि । नाडी-यन्वाणि । श्लाकायन्वाणि । उपयन्वाणि चेति ॥ २

तत्रौ चतुर्विंशतिः स्वस्तिकयन्वाणि । इह सन्दृशयन्वे । इह एव तालयन्वे । विंशतिर्णाणाः । अष्टाविंशतिः शलाकाः । पञ्चविंशतिरूपयन्वाणि । तानि प्रायश्चो लौहानि भवति तत्प्रतिरूपकाणि वा तद्वाभि । तत्र नामाप्रकाराणां व्यालानां सम-परिणामाणां मुख्यानि यन्वाणां प्रायशः सहशाणि तत्त्वात् तत्सारूप्यादागमाद्विशादन्व-यन्वदर्थनाद् युक्तितत्र कारयेत् ॥ ३

समाहिताणि यन्वाणि खरद्वज्ञामुखाणि च ।

सुष्ठुद्वाणि सुरूपाणि सूर्याणि च कारयेत् ॥ ४

तत्र स्वस्तिकयन्वाणाणाऽनुलभाणाणि सिंहव्याघ्रदकतरचुक्कचवैपिमाणोद् - प्रगालवृगेव्यंदककाककाकद्वारचासभासश्चात्युलूकचिङ्गिरयेन-गटप्रकौच-भङ्गराजाश्चलि-कर्णावभज्ञ-गन्दिसुखमुखाणि भस्त्राङ्गतिभिः कौलैरवद्वाणि मूलेऽहु शवदावत्वारडा-श्चलिविनष्टश्चयोऽवरवार्थसुपदिष्टन्ते ॥ ५

*Sharp Instruments* : Sharp instruments (*sastra*) are of twenty kinds. They are as follows : (1) Circular knife (*mandalāgra*);

सुनियहोऽनियहश सन्दंशी वोङ्शाङुलौ भवतस्त्रज्ञांसशिरासामुगतश्च्योऽरण्यार्थ-  
मुपदिश्येते ॥ ७

तालयन्त्रे चादशाङुले मतस्तालुवदेकतालुदितालके कर्णं नासागाङ्गीश्च्यानामाह-  
रण्यार्थम् ॥ ८

नाडीयन्त्राणि अनेकप्रकाराण्यनेकप्रथोजनान्वेकतो मुख्यान्वयतोमुखानि च, तानि  
स्तोतोगतश्च्योऽरण्यार्थं दोगदर्शनार्थमाचूषणार्थं क्रियासौकर्यार्थच्चेति । तानि स्तोतो-  
हारपरिणाहानि यथायोगपरिणाहदीर्घाणि च । भगवदराशोऽर्बुदव्रणवस्तुप्रारब्धिसूत-  
ड़हिदकोदरधूमनिरुद्धप्रकशसन्निरुद्धगुदयन्वाण्यलावृश्च यन्वाणि द्विपरिष्टाद वच्यामः ॥ ९

थलाकायन्वाण्यपि नानाप्रकाररण्यि नानाप्रथोजनानि यथायोगपरिणाहदीर्घाण्यि  
च । तेषां गङ्गूपदशरपुङ्गसपं फणवडिश्यमुखे हे हे एषयवृग्नचालनाहरण्यार्थमुप-  
दिश्येते । मसूरदलमावमुखे हे किञ्चिदानताये स्तोतोगतश्च्योऽरण्यार्थम् । घट-  
कार्पासक्तोचोषाणि प्रमार्ज्जनक्रियासु । वीणि दर्ढ्याङ्गतीनि खङ्गमुखानि चारीषध-  
प्रणिधानार्थम् । वीणाण्यानि जाम्बवदनानि वीणङ्गुशवदनानि षड्वाग्निकर्मस्त्रभि-  
मेतानि । नासार्वुदहरण्यार्थमेकं कोलास्थिदलमावमुखं खङ्गतीचोहम् । अङ्गनार्थ-  
मेकं कलायपरिमख्यलमुभयतो सुकुलायं । सूतमार्गविशेषनार्थमेकं मालतोपुष्य-  
हन्नायप्रमाणपरिमख्यलमिति ॥ १०

उपश्वन्वाण्यपि रञ्जुवेणिकापट्टचर्मान्तवल्कल लतादस्त्राषोलाशममुहर-पाणिपाद-  
तालाङुलि-जिह्वादन्त-नखमुख-वालाश-कटकशाखाषः वनप्रवाहृणहर्षायस्ताम्भयानि चा-  
राग्निमेषजानि चेति ।

एतानि देहे सर्वेणिन् देहसावयवे तथा ।

सम्भो कोष्ठे धमन्वाच यथायोगं प्रयोजयेत् ॥ ११

यज्ञकर्माणि तु निर्धातनपूरणवन्धनवृग्नवत्तनचालनविष्टेनविवरण-योङ्गमाग-

( 2 ) *Saw* (*kara-patرا*, resembling hand, that is, consisting of a thin blade with sharp teeth in the edge, as the hand has fingers) ; ( 3 ) *Lancet* (*vrddhi-patra*, a short, wide, sharp-pointed and two-edged blade, resembling the leaf of 'vrddhi'—*Batata edulis*) ; ( 4 ) *Canalicular knife* (*nakha-sastra*, resembling nail-parer) ; ( 5 ) *Gum lancet* (*mudrikā*, a short lancet of the size and shape of the last phalanx of the index finger) ; ( 6 ) *Thumb lancet* (*utpala-patra*, resembling the petal of *Nymphaea stellata*) ; ( 7 ) *Amputating knife* (*aruddha-dara*, a single-edged

विशेषधनविकर्षं या हरणावृक्षनोऽप्तमनविनमन-भज्जनोऽप्तमयनाच् यज्ञे वषदारणज्ञुकरण-प्रस्ता-  
खन-प्रधमनप्रमाणं नानि चतुर्थिं शतिः ॥ १३

खदुङ्गा चापि विभजेद् यज्ञकर्माणि त्रुष्णिनान् ।

असंख्ये विकल्पचाल्यानामिति निश्चयः ॥ १४

तवातिष्ठ्य लभसारमतिदीर्घमतिक्रस्याहि विषमशाहि बकं शिथिलमत्युप्रतं वृदुकोपं  
स्फुटमुखं वदुपाशमिति राहश यन्वदीषाः ॥ १५

एतैर्दीर्घैर्विनिर्दीर्घं यन्वमटादशाङ्गं लम् ।

प्रश्चकं भिषजां चैयं तद्वि कर्मसु योजयेत् ॥ १६

दृश्यं सिंहमुखादैस्त गृहं काङ्गुखादिभिः ।

निर्झरेत् तु शनैः शश्यं शस्त्रयुक्तिव्यपेष्यथा ॥ १७

निवर्त्तते साखगाहते च शश्यं निगट्छोड़ते च यज्ञात ।

यन्मुखतः काङ्गमुखं प्रधानं स्थानेषु सर्वे व्यधिकारि चैव ॥ १८

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cutting instrument) ; (8) *Needle* (*sūchi*, a slender, sharp-pointed instrument, used for puncturing the tissues, for guiding the thread in suturing or for passing a ligature round an artery); (9) *Bistoury* (*kuṣa-patra*, a long, narrow-bladed knife, shaped like the 'kuṣa' grass—*Eragrotis cynosuroides*) ; (10) *Hawk-bill scissor* (*āṭī-mukha*, an instrument with two blades, held together by a rivet, moving on the pivot and cutting against each other, resembling the bill of 'āṭī' bird—*Turdus Ginginianus*) ; (11) *Scissor* (*sarāri-mukha*, resembling the long and slender beak of heron) ; (12) *Concave bistoury* (*antaramukha*, having curved blade inside) ; (13) *Trocar* (*trikūrchchaka*, an instrument for withdrawing fluid from a cavity or for use in paracentesis, consisting of a metal tube—'cannula', open at both ends, in which fits a rod with a sharp three-cornered tip, which is withdrawn after the instrument has been pushed into the cavity; trocar is derived from French 'trois'—three, + 'carre'—side, having the same meaning of 'tri-kūrchchaka') ; (14) *Lenticular knife* (*kuṭhārikā*, an axe-like knife, resembling cow's tooth) : (15) *Aspirating needle* (*vṛīhi-mukha*, a hollow needle, used for withdrawing fluid from a cavity, an aspirator tube being attached to one end, the other end, shaped like

the rice grain, being thrust into the cavity) ; (16) *Iredectomy knife* ( *ārā*, an arrow-headed knife, resembling an owl) ; (17) *Scalpel* (*vetasa-patra*) a pointed, long and slender knife with convex edge, resembling the rattan leaf ) ; (18) *Hook* (*vadisa*, an instrument curved or bent near its tip, used for fixation of a part or traction ) ; ( 19 ) *Scaler* (*danta śaiku*, an instrument to remove tartar from the teeth ) ; (20) *Fine-pointed probe* ( *esani*, used for dilating contracted lacrymal puncta or examining the lacrymal canals).

*Uses* : Of them, the Circular Knife and the Saw can be used for excision and scarification ; Lancet, Canalicular Knife, Gum Lancet, Thumb Lancet and the Amputating Knife for excision and incision ; Needle, Bistoury, Hawk-bill Scissor, Scissor, Concave Bistoury and the Trocar for drainage ( of the fluid cavities ) ; Lenticular Knife, Aspirating Needle, Iredectomy Knife and the Scalpel for puncturing ; the Needle can also be used for puncturing ; Hook and the Scaler for extraction(scraping of tartar from the teeth etc. ) ; Fine-pointed Probe for finding out the passage and the direction of a sinus ; and Needles for suturation. In these eight kinds of action the use of ' *sastra*' ( sharp instruments ) are described.

The way these instruments shall be handled, shall be described now. The lancet and other incising instruments should be held by the top and the middle of the handle. For scarification, the Lancet and the Circular Knife should be held with slightly bent hand. All the drainage instruments should be held by the top of the handle. For the drainage of the fluid cavities, children, the aged, the delicately constituted, the timid, women, kings and the princes, the Trocar should be employed. Of the Aspirating needle, the Aspirator should be held in the palm of the hand, and the needle between the thumb and the index finger. The handle of the Lenticular knife should be held in the left hand, and the index and middle fingers of the right hand should be pressed upon it during operation. Iredectomy Knife, Saw and the Fine-pointed Probe should be held by the root (middle of the handle.). The rest of the instruments should be held properly (as to give the most effective result).

The shapes of these instruments are indicated by their nomenclature. And the Canalicular Knife and the Fine-pointed Probe are eight fingers' breadth long (about 5 inches). Needles shall be described later. The extremity of the Hook and the Scaler is slightly curved, and it is

sharp like the thorn or fine like the young leaf-blade of *Hordeum hexastichum*. The orifice of the Fine-pointed Probe is like that of an earthworm. The Gum Lancet is of the size of the top phalanx of the forefinger. The Scissor is ten fingers' breadth long ( about 6 inches ). And the rest of the instruments are about 6 fingers' breadth long ( about 4 inches ).

*Good Instruments* : The instruments which have good handles, are made of good iron (steel), are sharp, well-formed, and whose edges are fine and even, and without indentation, are the best.

*Defective Instruments* : The instruments that are bent, blunt, broken, jagged, too cumbersome, too light, too long or too short, are defective (these are the eight defects in sharp instruments ). The sharp instruments that have the opposite qualities of these, are to be used, excepting that of the Saw, where the jagged sharpness is necessary for sawing bones, for which it is used.

*Edges of the Instruments* : The edge of the incising instruments should be like the thickness of the tip of *Ervum* lens, of the scarifying instruments, half the thickness of that of *Ervum* lens, of the puncturing and the draining instruments like that of hair, and of the excising instrument half the thickness of the tip of hair.

*Sterilization of the Instruments* : Sterilization (*pāyanā*) of the instruments can be accomplished in three ways : (1) by caustics ; (2) by water ( by boiling the instrument in water ) ; (3) by oils (by immersing the instruments in antiseptic oils ). The instruments that are used in the excision ( extirpation ) of missiles, foreign bodies and bone ( saw ) should be sterilized by caustics. The instruments for the excision and incision of the tissues should be sterilized in water. The instruments that are used for the excision of vessels and tendons, should be sterilized in ( antiseptic and boiling ) oils. For sharpening the instruments, pale, polished stone should be used, and to prevent the dullness of the edge ( and rusting ), they should be incased in a box, made out of the wood of silk-cotton tree ( *Bom-bax heptaphyllum* ).

The instruments that are very sharp and bright, and supplied with good handles and are of proper size, should only be used in operation.”

*Suśruta I. 8. 2-10<sup>१७</sup>*

197. विश्विः शसाचि । तद्यथा । मखलायकरपवडिपवग्खश्व-मुद्रि-  
कोव्यवपवकार्षधार-सूची-कुशपवाटीम् ख-शरारिम् खान्तर्मुखतिकूर्चक - कुठारिकाग्रीहि-  
मुखारावेतसपत्र-बण्डिष्ठ-दक्षयन्त्रे वस्त्र इति ॥ २

तत् मखलायकरपवे स्थानं वेदने वीक्षने च । डिपत् गखश्व-मुद्रिकोव्यवपत्-

*Lesions that need Excision Operation:*  
**"Excision ( or extirpation ) should be performed**

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कार्बोधाराणि देहने भेदने च । सूचीकुरुपत्राटीमुख्यरारिमुख्यान्तर्मुख्यतिशुर्काणि  
 विकावये । कुठारिकाव्रीहिमुख्यारावेतमपत्रकाणि व्यधने सूची च । वडिंशं दलशङ्-  
 शाहरणे । एष्व्य एवणे आतुलोभ्ये च । सूचः सेवने । इत्यदिव्ये कर्मस्थापयोगः  
 शस्त्राणां वास्त्रातः ॥ ७

तेषामय यथायोगप्राहणसमासोपायः कर्मसु वक्षते । ततु इदिपत् इनफल-  
 खाधारणे भागे गृह्णीयाहै दग्धाव्ये च सर्वाणि । इदिपत् मरुलायस्त किञ्चिदुत्तान-  
 पाणिना लेखने वह्योऽवार्थ्यम् । हनाये विकावणानि । विशेषेण वालवृद्ध-  
 मुकुमारभीक्षनारीणां राजा वाजपवाचाच तिशुर्किन विकावयेत् । तलप्रक्षादितड्का-  
 मङ् छप्रदेशिनीभां व्रीहिमुखम् । कुठारिकां वामहसन्यसामितरहस्तमध्यमाहूश्याहूह  
 विष्वक्षयाभिहन्यात् । आराकरपत् षष्ठो भूले । शेषाणि तु यथायोगं गृह्णीयात् ॥ ८

तेषां नामभिरेवाङ्गतयः प्रायेण व्याख्याताः । तत्र नरुश्चैष्व्यावटाहूसि ।  
 सूचो वचयन्ते । वडिंशं दलशङ् शानताये तीक्ष्णगृहकप्रदेशप्रभाणा मुद्रिका । दशाहूला शरारिमुखी  
 सा कर्त्तरीति कथते । शेषाणि तु षड्हूलानि ॥ ५

तानि सुयहाणि सुलोहानि सुधाराणि सुह्याणि सुसमाहितसुखाणाण्यकरालानि चेति  
 शस्त्रसम्पत् ॥ ६

तत्र वक्तं कुरुत् खर्षणं खरधारमतिश्युलमव्यल्पमतिदीघ्मतिक्षसमित्यष्टौ शस्त्र-  
 दोषाः । अतो विपरीतगुणमाददीत अन्यतु करपत्रात् तज्जि घरधारमस्थिक्षेदनार्थम् ॥ ७

तत्र धारा भेदनानां मासूरी, लेखनानामर्वमासूरी, व्यधनानां विकावणानां  
 कैश्चिकी, छेदनानामर्वकैश्चिकीति ॥ ८

तेषां पायना त्रिविधा आरोदकतेषेषु । ततु आरपायितं शरश्व्यास्थिक्षेदनेषु ।  
 उद्दकपायितं मांसच्छेदनभेदनपाठनेषु । तैलपायितं सिरावधनवायुम्बेदनेषु । तेषां  
 विशेषार्थं द्वाचाशिला माषवर्णा, धारासंस्थापनार्थं शाश्वतीफलकमिति ॥ ९

in fistula-in-ano, tubercles, suppurative tumors, non-suppurative tumors, gummatæ, wart, foreign bodies in bones and tissues, hairy moles, Sarcoma, tonsillitis, sloughing tendons-muscles and vessels, tumor of the palate, condylomata, myxoma of the gullet, chancre, fibroma and myoma.

*Lesions that need Incision* : Incision (lancing) should be made in all (suppurative) tumors, except those caused by the derangement of the three humors (non-suppurative tumors), erysipelas, oscheopyedema, bubo, diabetic boils, carbuncle, galactoposterma (or mastosyrinx), pustules of the penis, stye, pustules of the foot, fistula, suppurative tonsillitis, suppurative eruption of the penis, gumma of the cornea, pustular abscesses, abscess on the palate, gum-boils, the tumors or sinuses that develop after suppuration, cyst formed round the nucleus of a calculus, or any other kind of suppurative tumor.

*Lesions that need Scarification* : Scarification should be made in the four forms of throat inflammation, leucoderma, ranula, inflammation of the gum, tubercles, lachrymal fistula, epiglottitis,

यदा सुनिश्चितं शस्त्रं रोमच्छेदि सुस्थितम् ।

सुगृहीतं प्रमाणेन तदा कर्त्तव्यं योजयेत् ॥ १०

सुश्रुतस्त्रहिता, सूतस्थानम्, ८४

gummata of the throat, psoriatic patches, and granulations.

*Lesions that need Punctures*: Punctures should be made in cirsoid aneurysm, hydrocele and ascites.

*Lesions that need Probing*: Probing should be made in fistulas, fistulas with foreign bodies, or those extending sideways.

*Lesions that need Extraction*: Extraction should be made in three kinds of gravel, tartar on the teeth, wax in the ears, calculi, foreign bodies (missiles), mal-presentation of the fetus and the impacted feces in the rectum.

*Lesions that need Drainage* :—Drainage should be performed in all kinds of (suppurating) tumors except those that develop by the derangement of the three humors (non-suppurative tumors), lepromata, painful abscess, carbuncle, otorrhea, elephantiasis, toxic blood (blood in the infected region), furuncle, erysipelas, cysts, three kinds of chancres (hard, mixed, and soft chancres), breast-abscess (or fistula), suppurative bubo, pyorrhea, abscess and gummatous of the palate, dental caries (causing suppuration in the gum), gingivitis, epulis, ulocase, gumboil, chancre of the lips, and pustules.

*Lesions that need Suturation* ;—Suturation

should only be made in those places which have been opened and been completely drained off (the foreign matter), or the fresh wounds near the movable joints.

*Wounds that are not fit for suturation:* Sutures should not be applied to those wounds caused by caustics, cautery and toxins, or in those where there is discharge of gas, or in the interior of which there is saries or foreign body. These should be at first disinfected ; dust, hair, nails, fragments of bone (any foreign body), when found in a wound, should be removed before sutures are applied, as otherwise they are likely to provoke suppuration and pain. Therefore they should at first be disinfected. The lips of the wound then should be raised and placed in proper apposition, and sutures applied slowly with the fine cotton thread, or the bark-fiber of *Caesalpinia digynia*, flax, catgut (*snāyu* = tendon), hair (horse hair), fibers of *Sansevieria zeylanica*, or *Tinospora cordifolia*, in any of these sutures, (1) Twisted suture (*vellitaka*), (2) Quilled suture (*gophnikā*), (3) Continuous suture (*tunna-sevani*), (4) Interrupted suture (*rju-granthi*) or any other kind best suited to the requirement, and after the suturation is over, the sewed parts should be gently pressed by the finger and levelled. In

parts of the body covered with little flesh, or over joints, a full-curved suture needle, of two fingers' width long, should be used. For fleshy parts, a straight, three-edged, suture-needle, three fingers' breadth long, is proper. In the vital parts, scrotum and the abdomen, a half-curved suture-needle (curved like a bow) is good. These three varieties of needles should be sharp-pointed, their body rounded like the flower-stalk of *Aganosma cargophyllatum*, and should be capable of easy handling. Sutures should not be made either too far off or too close to the edges of the wound. In the former case, lips of the wound will become painful, and in the latter case, they may be torn off. Then the stitched part should be covered with cotton (as a surgical dressing) or linen (as a lint), and a powder compound of *Aglaia roxburghii*, antimony sulphide, *Glycorrhiza glabra*, and *Symplocos racemosa*, or the powder of *Boswellia serrata* or the ashes of burnt linen, should be sprinkled over it (as antisepsis). Then after proper bandaging, the patient shall be told the hygienic rules, he will have to observe." *Sūrūta I. 25. 2-12<sup>o</sup>.*

198. देया भगव्दरा यन्थः शैमिकस्तिलकालकः ।

त्रयवर्त्तार्द्युदान्वर्षवर्षकोलोऽस्यामांसगम् ॥

*Caustics* :—“For particular purposes, of all sharp or accessory instruments, caustics are the

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शल्यं जहुमयिनां ससङ्गातो गलाशुचिका ।  
 बायुमांससिराकोथी वज्रोक्तं शतपोनकः ।  
 अभ्युप्त्यसोपदंशास्त्रं मांसकव्यधिमांसकः ॥ ३  
 मेद्या विद्रध्योऽन्यत् सर्वजाद् यन्यथस्यायः ।  
 आदितो ये विषपर्णश्च इवयः सविदारिकाः ॥  
 प्रमेहपिण्डकाशोफ-सानरोगावस्थकाः ।  
 कुम्भीकालुशयीनायो इन्द्रो पुष्परिकालजी ॥  
 प्रायशः छट्टरोगाश्च पुण्यं टी तालुदक्षणी ।  
 तुष्णिकीरी गिलायुश्च पूर्वं ये च प्रपाक्षिष्यः ।  
 वसिष्ठाश्चाभ्यरोहितोभेदोजा ये च कीचन ॥ ७  
 खेत्याच्चतुष्मी शोहिष्यः किलासम पञ्जिष्ठिका ।  
 मेदोजो दन्तवैद्यर्मे यन्द्यवत्मांधिजिञ्चिका ॥  
 अर्शांसि मख्यलं मांस-कान्दो मांसोऽप्तिस्थाया ॥ ४  
 वेध्याः शिरा वडुविधा मूलुऽङ्गिर्दकोदरम् ॥ ५  
 एत्या नाशः सश्लायाश्च व्रणा उन्मार्गिं च ये ॥ ६  
 आहार्याः शर्करासिको दन्तकर्षमलाश्मरी ।  
 शल्यानि सूदगभांश्च वर्द्य निषितं गुदे ॥ ७  
 खात्या विद्रध्यः पच्च भवेतुः सर्वजाहते ।  
 कुष्ठानि वायुः सहजः शोफो वस्त्रे कदेशजः ॥  
 पाल्यामयाः झीपदानि विषज् एष्च शोषितम् ।  
 अब्युदानि विषपर्णश्च यन्यथादितस्तु ये ॥  
 वयस्याश्चोपदंशाः सानरोगा विदारिका ।  
 श्रीविरो गलाशालकं कष्टकाः ह्रस्मिदग्नकः ॥ ८

best (when alkalies in concentrated form (caustics) are brought into contact with the animal

दक्षिणः सौपकुशः शीतादी इक्षपुष्टुटः ।  
 पित्ताक्षक्षफजाचौम्ब्याः चूद्रोगाच्च भूयः ॥ ८  
 सीमा मेदः सन् त्वाच भिजाः शुलिखिता गदाः ।  
 स्थीव्रणाच ये चैव चक्षस्तिव्यपाचिताः ॥ ९  
 न चाराप्रिविष्टुंडा न वा मारुतवाहिनः ।  
 नाम्बर्हितश्वस्याच तेजु सम्बिशोधनम् ।  
 पांशुदोमनखादीनि चलमस्ति भवेत् यत् ॥  
 अहतानि धतोऽमूलि पाचयेत्युर्वर्णं व्रणम् ॥  
 इत्य विविधाः कुर्यात्तादितान् विशेषधैर् ॥ १०  
 ततो ग्रन्थं समुद्रम् खापयित्वा यथास्तितम् ।  
 सीव्येत् सुखेष सूक्ते च वस्त्रे नाशमनकर्त्त वा ॥  
 शणजचीमस्त्राभ्यां खाय । वालिन वा पुनः ।  
 मूर्खांगुष्ठचीतानेवां सीव्येद्देहितकं ग्रन्तः ॥  
 सीव्येद्गोफक्षिकां चापि सीव्येषा तु न सेवनीम् ।  
 कर्जुयन्ति तथा चापि यथादीगमदापि वा ॥  
 द्वितीयलग्नादि सम्बी च सूक्तो हत्ताङ्गुलाद्यम् ।  
 आयता व्युत्तुला व्युत्ता मांसले चापि पूजिता ॥  
 धनुर्वक्त्रा इता मर्त्य-फलकोषोदरीपरि ।  
 इत्येतास्तिविधाः सुचीकीच्छायाः सुसमाहिताः ॥  
 कारयेत्तात्तोपुष्ट-इत्यायपरिमत्तुलाः ।  
 नातिदूरे निष्ठादे वा सूक्तो चक्षेष्वि यातयेत् ।  
 दूरादुत्री ग्रन्थोद्यम् च विष्ठादेऽप्युद्यमम् ॥ ११  
 चम चीमपिषुम्बन्नं संसूक्तं प्रतिचारयेत् ।  
 विष्ठाङ्गुलग्नव्याह-रोप्रचूर्णः समन्वयः

tissues, they enter into chemical combination with the oxygen present, and thus give rise to an active necrosis or destructive inflammation ; alkalies are likewise solvents of albumin ; these physical and chemical properties render the caustic alkalies active in producing counter-irritation, and their escharotic effects have been made use of in the destruction of morbid tissue, whether of neoplastic or inflammatory origin, and chronic synovitis). Due to the escharotic property of the (concentrated) alkalies, they are called caustics (*kṣārc*). They are acrid, irritant, pungent, (and their external use causes) destruction of the tissues (eschars), corrosion, disinfection, granulation, desiccation, hemostatis, scarification, (and their internal administration cures), intestinal worms, hyperacidity, eructation, cutaneous lesions, auto-intoxication ; but their excessive use induces impotence.

Alkalies are of two kinds (concentrated which is strong, and non-concentrated which is mild), for external application (strong) and for internal administration (mild). Their external application

गङ्गाकीफलचार्यैर्वा चीमध्यामेन वा पुनः ।

ततो ग्रन्थं यथायोगं बहाचारिकमादिश्वेत् ॥ १२

सद्गुरुवर्हिता, सूतस्यानम्, १५.

is indicated in lepromes, keloid, ringworm, leucoderma, psoriasis guttata, fistula-in-ano, tumors, indolent ulcers, fistula, condyloma, mole, impetigo, lichen planus, warts, external sores, dermatophyte, poison-bites, and guminata ; besides these, the application of caustics in seven kinds of mouth diseases (tumor of the tongue, stomatitis ulcerosa, chancres of the lips and the tongue, etc.) and three kinds of throat-neoplasms, is appropriate. Internally alkalies may be administered in auto-intoxication, adenitis, tympanites, indigestion, dyspepsia, anorexia, constipation, gravel, calculus, abdominal tumors, intestinal worms, poisoning and gummata. However its (internal) use is counter-indicated in persons who have a tendency to hemorrhage, biliaryness, in children, the aged or weak persons, or those who are suffering from giddiness, delirium, epilepsy and amaurosis." *Susruta I. 11. 2-5<sup>198a</sup>*.

198 (a). शस्त्रातुश्चेभ्यः चारः प्रधानतमस्त्वेद्य-भैय-सेस्थ-करणात् विदोषज्ञालादिविषयावचारवाच ॥ १

तद चरणात् चरणाहा चारः । गानीवधिसमवायात् विदोषः । शुक्रात् सौम्यसाम सौम्यसापि सतो दहनपचमदारणादिशक्तिरविद्वा, स खलाद्येवधिगण-भूयित्वात् कटुक उच्चसोऽः पाचनो विलयनः शोधनो रोपणः शोषणः सम्पन्नो शेषः क्रियामवप्नुत्विभिन्नदाहुप्रहृष्टा पुंखस चातिसेवितः ॥ १

तद विविधः प्रतिकारवीर्यः पाणीयस । तद प्रतिकारवीर्यः कुडकिटिमद्कुकिलास-

*Cautery* : "Cautery is more potent in its action than caustics.. For once cauterized, lesions lose their sepsis, and even those which defy the medicinal, operative and caustic treatments, become hereby amenable." *Susruta I.* 12. 2<sup>00</sup>.

*Leeches* : "By leeches (*Hirudo*), bleeding (or removal of congestion) can be accomplished in the easiest way of kings, wealthy personages, women, children, the aged, timid, weak or delicately constituted individuals." *Susruta I.* 13. 2<sup>00</sup>.

*Enema* : "As enema (*vasti*) serves multifarious purposes, according to the medical experts,

मस्तकभगवदरार्थुददुष्टव्यवनाहीचर्यकीलतिल-कालक - व्याघ्रव्यह - मशकवाच्चविद्धि-  
क्षिमिविवादः सु उपदिश्वते सप्तसु च मुखरोगीष्पूजिहोपकुशदनवैदेभेतु तिक्षु च  
रोहिणीष्वेतेतु च वानुव्यवप्रणिधानमुक्तम्। पानीयसु गरगुओदराप्रिष्ठवाजीर्दारो-  
चक्षानाह वर्कराइमर्थाभ्यक्तविद्धिक्षिमिविवादः सप्तव्यहते ॥ ४

चहितसु रमपित्तव्यरितपित्तप्रकाशवात्तु इदुर्बलव्यवमदमस्त्वर्णतिमिरपीतेभ्योऽप्येभ-  
वं वंविषेभः। तस्य तरसारवद्युत्ता परिवावधीत्। तस्य विकारोऽप्यत् ॥ ५

सुहुत्तु-हिता, सूक्ष्मगम्भृ, ११।

199. आराहप्रिंगरोद्यान् क्रियासु व्याख्यातः। तद्वाक्षानां दीप्तस्वामुक्तमर्त्तवा-  
हे चक्षव्यवसायेरसाज्ञानां तत्त्वाभ्यावः ॥ ६

सुहुत्तु-हिता, सूक्ष्मगम्भृ, १२।

200. वृपाक्षवाक्षविरभोददुर्बलव्यवनारोदुक्तमाराचामकुशहार्ये परमसुक्तवासेऽव-  
शोचितावसेचनोपादोऽमिहिमो जडीकरः ॥ ७

सुहुत्तु-हिता, सूक्ष्मगम्भृ, १३।

it is the beat of all analeptic (*sneha*) remedies. If it be properly applied, it makes the weak strong (Stimulating enema), the lean stout (enema nutriens), the stout lean (enema purgans), strengthens eye-sight ( by removing the decomposing materials from the intestine, the toxic products of which are absorbed in the system, and provoke reflexably various maladies ) and prolongs youthfulness. It promotes the general health of the body, adds to its vigor, brightens complexion, is a restorative of health and conduces to the logevity of life ; and its use in fever (enema purgans), diarrhoea (enema adstringens), amaurosis, catarrh, cephalalgia, ophthalmia, hemiprosoplegia, mimic convulsion, apoplexy, general paresis, tympanites, hemiplegia, flatulence, gravel, hyperalgia, oschitis, syphilis, constipation, strangury, bubo, hemorrhage, hydrothionuria, fecal impaction, aspermia, mestastasia, galactozemia, cardipalmus, lockjaw, torticollis, piles, calculus and abortion, is appropriate.

*Fountain-syringe* : For a boy one year old the tube (*netra*) shall be six fingers' breadth long, having the dimension of the little finger, and at the extremity of which, the nozzle (*karnika*) should be fixed, one and a half fingers'

breadth long ; the orifice at the mouth of the tube should be like that of a heron's feather, and at the end, like Phaseolus mungo. For a boy of eight years of age, the tube shall be eight fingers breadth long having the dimension of the ring-finger, and at the extremity of it, the nozzle should be fixed two fingers' breadth long ; the orifice at the mouth of the tube shall be like the feather of the vulture, and at the end like Phaseolus radiatum. And for a person, sixteen years old, the tube shall be ten fingers' breadth long, having the dimension of the middle finger, and at the extremity of it, the nozzle should be three and a half fingers' breadth long ; the orifice at the mouth of the tube shall be like the peacock's feather, and at the end like that of a pea. The reservoir (*āsthāpana*) for the enema, for persons, one, eight or sixteen years of age shall be the size of their two handfuls, four handfuls, and eight handfuls of their individual hands respectively ( the modern fountain-syringe is an apparatus, consisting of a rubber reservoir for holding fluid for the enema, to the bottom of which is attached a rubber tube, provided with a suitable nozzle, usually made of vulcanized rubber ; and it is used for rectal or vaginal injections, irrigating wounds, etc., the

force of the flow being regulated by the height of the reservoir above the point of discharge).

The size of the tube and the reservoir is not only to be graduated according to the age ( of the patient ), but also in addition to it, his physical condition and vigor.

For a person, above twenty five years of age, the tube shall be twelve fingers' breadth long. having the dimension at the mouth like the thumb, and at the end like the little finger, and the nozzle shall be three fingers' breadth long ; the orifice of the tube at the mouth should be like the feather of a female vulture, and at the end like the stone of plum. The tube should be firmly fixed with the reservoir. And the reservoir should be capable of holding twelve handfuls of enema. After seventy, the tube shall remain just the same, but the quantity of the enema should be reduced to that of a person of sixteen years of age.

The tube should be made of gold, silver, copper, bronze, ivory. horn, glass or wood, polished, strong, shaped like the bovine tail with gradually reducing dimension, straight and with globular orifice. And the reservoir is made out of the bladder of the matured cow, buffalo, boar, goat or sheep, and it should be flexible, even.

strong and of the required size." *Susruta*  
IV. 35. 2-7<sup>201</sup>.

201. तत्र खेहादोना कर्षणां वसिकर्म प्रधानममाहुराचार्याः । कथात् ?  
अनेककर्मकरत्वाहस्ते । इहवसिर्नामाविधद्वयस्त्योगाहोषाणां सुंशोधनस्त्येन-  
स्त्येन गङ्गणानि करोति, चाणगुकं वाजोकरोति, क्षयं दृढयति, स्थूलं कर्षयति, अद्भु-  
प्रोक्षयति, वलोपस्थितमुपहन्ति, वयः स्थापयति । शरीरोपचयं वर्णवलमारीमय-  
मायुषः परिवर्द्धित्वा करोति वक्षिः सम्युपासितः ; तथा ज्वरातीसार-तिमिरप्रतिश्लाय-  
शिरोतोगाधिगन्धाद्वितीयेनपक्षयाधाते काङ्ग-सर्वाङ्गरागभागोदर-शर्करागूल-इट्ट्युप-  
दंशानाहमूलकाङ्ग-गुच्छ-वातशोणित-वातमूतपुरोषोदावर्त्त-गुका। संव-सन्ध्य-नाशक्षज्ञुमन्वा-  
यहार्थोऽग्नरोमूदगर्भप्रभुतिषु चाल्ययनुपयुच्यते ॥ २

वक्षिर्वाते च पिते च कफि रक्ते च शस्ते ।

सुंसर्गे सद्गिपाते च वक्तिरेव हितः सदा ॥ ३

तत्र सांवत्सरिकादविरटवर्षाण्ये षड्ददशाङ्गुलप्रमाणानि कनिठिकानामिका-  
मध्यमाङ्गुलि-परिणाहान्यये उद्धर्षाङ्गुल-हाङ्गुलाई-टतीयाङ्गुलसद्गिपिटकर्थिकानि कह-  
उयेनवर्ध्यपवनाङ्गीतुव्यप्रवेशानि सुइमाषकालायमावजोतासि विद्याहो वाणि । तेजु-  
त्वास्थापनद्रव्यप्रमाणमातुरहस्यसचितिन प्रस्तेन सचिती प्रदत्ती गी चत्वारोऽटी  
विषेयाः ॥ ४

वक्तिरेतु नेवाणां वसिमानस्त्येव हि ।

वद्योवलश्चरीराचि समोक्त्य वैविषिधिम् ॥ ५

पक्षविंशतिरेतु वादशाङ्गुलं मूलिङ्गुठीदरपरिणाहनये कनिठिकोदरपरिणाह-  
मये लूङ्गुलसद्गिपिटकर्थिकं गटप्रवनाङ्गीतुव्यप्रवेशं वोक्षस्थिमावें हिद्रं, तिड-  
कालावमावें हिद्रमिलेके । सर्वाचि मूलि वसिमिद्रव्यमार्थं चिकर्थिकानि ।  
आस्थापनद्रव्यप्रमाणमु विहिता वादश प्रदत्ताः । सप्तसेताहुं नेवप्रमाणमितदेव,  
द्रव्यप्रमाणमु विरुद्धवर्द्धते ॥ ६

तत्र नेवाचि सुवर्चं एतत्तावद्योरीतिहस्यमवितदसारवदाचि शक्तिनि हङ्गामि

*Fractures* : "One suffering from fractures, should avoid salt (sodium chloride), pungents, alkalies, acids, sexual indulgence, exposure to the sun, exercise and desiccant food. He should take cooked fine rice, meat-broth, milk, milk-fat, pea soup, and stimulative foods and drinks. The bark of Glycyrrhiza glabra, Ficus glomerata, Ficus religiosa, Butea frondosa, Terminalea arjuna, Bambusae, Shorea robusta and Ficus indica for splint (*kuśa*). For liniment, Rubra manjista, Glycyrrhiza glabra, Pterocarpum santalinum, and buttered rice-paste which has been repeatedly washed in water (that is fat has been washed out from the surface of the rice paste) should be used. The wound should be bandaged every seventh day in the wintry season, every fifth day in the temperate season, every third day in the hot weather, or according to the urgency of the needs. But if the bandage (splint) is loose, reparation of the joints does not take place, and if too tight, it is apt to cause inflammation of the tissues, pain and suppuration ; therefore

गोपुष्टाङ्गतीमूऽनि गुटिकासुक्षामि । यसयथाइद्वानां वद्दो नातिवर्षा छड़ाः  
प्रवाप्यवस्थो गोपहिवराहाजोरथापाम् ॥ ०

सुदृढतस्त्विवा, किञ्चिद्वित्तसामन्, १५।

it should be properly bandaged (The reparation of the bone in fractures depends on two factors : (1) The fragments of the fractured bone are to be placed in apposition to one another in the normal position, and kept in that condition from a week to eight weeks, according to the needs of the case, so that the bone can be repaired and consolidated. (2) The reparation principally takes place in the soft tissues surrounding the bone, and from the torn periosteum granulation tissue is formed, which when calcified forms callus and which by ossification is converted into bony structure ; therefore if the splint has been put on before the bones have been properly set, or if the bandage is loose, or due to movement, the fragments change their place, then of course reparation can not take place, and after three months time, they lose their recuperative power ; if on the other hand, the fragments of the bones are very rigidly fixed, face to face, without leaving any space between them, and the bandage is very tight, there will be then minimum of callus formation. Therefore for successful reparation, both these extremes are to be avoided, and this can be only faithfully determined by X-ray examination. In children

normally, the reparation is rapid, especially in cancellous tissues)." *Susruta* IV. 3. 2-8<sup>10</sup>.

*Fractures of the Phalanges or dislocation of the Metacarpo-Phalangeal joints* : "Whether the phalanges are fractured or the joints are dislocated, they should be placed in the normal apposition and bandaged (Wyeth's finger-bandage or roller-bandage), and upon it (vulnerary) butter should be applied.

*Metatarsal fractures* : In the fractures of

202. लदव्यं कटुकं चारमस्त्रं नेत्रुचमालपम् ।  
 व्यायामस्त्र न सिवेत भग्नो इच्छाप्रमिष च ॥ ७  
 शालिर्मासरसः चीरं सपिंयूषः सतीजः ।  
 दृष्ट्यचाहपानं स्थाइयं भग्नाय जानता ॥ ८  
 मधुकोषु चाराचत्व-प्राणकाङ्क्षभत्वचः ।  
 वंशसर्ववटानो वा कुर्वार्थसुपसंहरेत् ॥ ५  
 आलेपनार्थे मलिङ्गां मधुकं रक्ताचन्दनम् ।  
 अतधीतष्ठतोन्निश्च शालिपिष्टच संहरेत् ॥ ६  
 समाहादथ समाहात् सीम्ये चृतुप वन्धनम् ।  
 साधारणेतु कार्तव्यं पक्षमि पक्षमेऽहग्नि ।  
 आग्नेयेतु त्युहात् कुर्याहप्रदोषवशेन वा ॥ ७  
 तवातिशिथिलं वस्ते सम्भस्थैर्यं न जायते ।  
 गाढे नापि त्वगादीनो शोको दक्ष पाक एव च ।  
 तस्यात् साधारण्यं वस्त्रं भग्ने वंसन्नि तविदः ॥ ८  
 सुहृतसंहिता, चिकित्सा-सामग्री, १ ।

the metatarsus, (vulnerary) liniment should be applied, then bandaged, and upon it splint should be placed (to prevent motion and displacement of the bones).

*Fractures of fibula and femur :* In fractures of the fibula (tibia) and the femur, the parts should be massaged with a liniment and the fragmented bones brought to apposition ; then after fixing a splint, they should be bandaged. If the neck of the femur project, or the fragments of the bone tear out through the flesh, it should be given a circular bandage.

*Fractures of the hip-bone :* In the fracture of the os innominatum (usually in the neck), the raised part of the bone should be lowered, and the depressed part raised, and thus it should be bandaged. When the hip-joint has been put in its normal place, it should be irrigated (with a vulnerary or an antiseptic).

*Fractures of the Ribs :* If the ribs are fractured, they are to be rubbed with a salve, and then after placing a pin (*kavalikā*), the ribs are to be fixed by 'twisted suture' (*nivandhani*), and then bandaged ; later the patient is to be laid in an extension splint, simple (*droni*) or filled with (vulnerary) oil (*katāha*).

*Dislocation of the scapulo-humeral joint :* In the dislocation of the scapulo-humeral joint, the humerus is raised, by using a hammer at the axilla, and when the bones are in their normal apposition, affixed by the 'spica bandage for the shoulder' (*svastika-vandhana*).

*Dislocation of the Elbow-joint :* If the elbow joint is dislocated, it should be massaged, and then put in the normal position through extension and flexion movements ; when it is done, it should be salved. The same treatment is applicable in the dislocation of the knee-joint, ankle-joint and radio-carpal joints (wrist-joint).

*Fractures of the metacarpus :* In the fractures of the metacarpus after proper bandaging, it should be moistened with a (vulnerary) oil ; then to find out the strength of reparation, it should be gradually tested by holding upon the palm of the hand, a dried cow-dung ball (very light), clay-ball, and at last a stone.

*Dislocation of the acromio-clavicular joint :* In the dislocation of the acromio-clavicular joint, if the (outer end of the) clavicle be displaced upwards, or downwards (from the acromion), after fomentation, it should be raised in the former case by a hammer, and in the latter case, depressed, and bandaged with a strong support

(Dessault's bandage : in obstinate cases, if the displacement persist and cause discomfort, the bones should be held together by wiring).

*Fracture of the Humerus* : In the fracture of the humerus, the treatment is similar to that of the femur.

*Sprain of the Cervical vertebral articulations* : If the neck is bent or depressed, it should be brought to apposition by pressure upon the cervical vertebræ and (with the traction-aid of) maxillary bones ; it should then be bandaged after splint, and the patient laid to bed on his back for a week.

*Dislocation of the Temporo-Maxillary joint* : In the dislocation of temporo-maxillary or temporo-mandibular joints, the bones should be put in proper apposition and held together by five-tailed (*pañchāngī*) bandage ( used as four-tailed bandage now-a-days), and there should be nasal injection of errhine, made of a sedative drug-cooked in butter.

*Pyorrhea alveolaris* : If in young people, the teeth become loose, associated with bleeding gum, without any external injury, it should be treated by antiseptic cold wash and injections ; and the patient shall drink milk (during the treatment) with the (tubular) stem of *Nymphaea stellata*.

In case of old men, the loose teeth should be extracted (by a forceps).

*Injuries to the Nose* : If the nasal bone caves in or is bent (by traumatism or syphilitic lesion), then it should be raised and straightened (by a speculum) and then for respiration, in two nasal cavities, two double-mouthed tubes should be inserted. When it is done, it is to be bandaged, and the bandage to be kept moistened by a (vulnery) ointment.

*Injuries to the Ear* : If the (ossicles of the) ears are broken, they should be put in their apposition, then after an application of a (vulnery) ointment, they should be bandaged and treated like ordinary wounds.

*Injuries to the Cranium* :—In the fracture of the frontal bone, if the brain matter has not come out (if the dura matter has not been penetrated or hurt), after liniment, the wound shall be bandaged, and the patient shall take clarified butter (?) for a week.

*Inflammation* : If due to an accidental fall or traumatism, any part of the body becomes inflamed without any (apparent) injury, it shall be treated by cold application and fomentation alternatively.

*Fractures of the Femur and the leg bones* :

In the fractures of the leg-bones (tibia and patella) or of the thigh (femur), the patient has to be lain in wooden extension bed, and for the maintenance of the steady traction (until the consolidation of the bone has taken place, and to prevent the tension of the muscles which prevents the reparation of the fracture), the leg or the thigh has to be fixed with five nails ; thus in the fracture of the leg bones, there should be two nails on each side of the leg, and against the sole, upon the wooden frame (to prevent movement, which interferes with consolidation of the fractured bones) ; in case of the fracture of the femur, two nails on each side of the thigh, and at the hip joint should be fixed. (This treatment in the fractures of the femur or the leg bones, is very similar to the modern practice by Hodgen's nail extension splint). This is also applicable in the fractures or dislocations of the pelvis, vertebrae and the clavicle. If the dislocation is old, this treatment is to be preceded by embrocation to soften the ligaments.

*Fractures of Patella :* If the fractured patella (*kānḍa*) has consolidated in wrong apposition, it has to be broken up (artificially) and then to begin treatment, after putting it in the normal apposition.

*Amputation of a dried bone :* If the flesh has retracted from a protruded bone, leaving it dry, then the bone has to be amputated (by saw) carefully up to the fleshy part, and then it has to be treated like a fresh wound ( by a recurrent bandage)." *Susruta IV. 3. 23-42<sup>o</sup>*.

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203. भयां वा सन्धिसुक्रां वा स्थापयित्वाङ्गुलौं समम् ।  
 अग्नावेष्य पट्टे न छतसेकं प्रदापयेत् ॥ २१ .  
 अभ्यज्य सर्पिं वा पादं तलभग्नं कुशीतरम् ।  
 वस्त्रपट्टे न बन्नीयाद्वच व्याधाममाचरेत् ॥  
 अभ्यज्यायामयेऽङ्गुष्ठामूर्खच सुसमाहितः ।  
 दस्ता हृष्टवचः शीता वस्त्रपट्टे न वेष्टयेत् ॥ २३  
 मतिमाणक्योगेण आन्धे दूर्घस्थि निर्गतम् ।  
 रक्तिं पित्तित्वापि वन्नीयात् पूर्वेषहिष्क ॥ २४  
 आन्धे दूर्घमधो वापि कटोभग्नु मानवम् ।  
 ततः स्थानस्थिते सम्बी वलिभिः समुपाचरेत् ॥ २५  
 पर्युकास्थ भग्नासु छताभ्यतास्थ तिष्ठतः ।  
 दिविषास्थ वा वामास्तुम्बन्य निवन्धनोः ॥  
 ततः कवलिकां दस्ता वेष्टयेत् सुसमाहितः ।  
 तेलपूर्वे कटाहि वा द्रोणां वा शाश्वयेन्नरम् ॥ २६  
 मुष्णेनोत्तिष्ठेत् कथामसंसम्बो विसंहते ।  
 स्थानस्थितच वन्नोत् स्वलिकेन विचचयः ॥ २७  
 क्षीरं रन् तथा सन्धिसङ्गुठेनागुमाज्ज्येत्  
 कानुवज्य ततः सन्धिं पीडयेत् क्षीरं राजुतम् ।  
 प्रसार्वाङ्गुष्ठवेष्टेन लेहसिकच दापयेत् ॥ २८

*Rhinoplasty* : The portion of the nose to be covered over, is to be measured (exactly) with a

एवं जागुनि गुरुके च मणिकर्णे च कारयेत् ॥ २६

उसे तत्र समि छात्वा तत्रभग्रस्य देहिणः ।

बध यःदामसेलेन परिषेकाच्च कारयेत् ॥

प्राणोमयमयं पिष्ठं धारयेन्मृदयं ततः ।

इसे जातवले भाषि कुर्यात् पाषाणधारणम् ॥ ३०

सर्वसुन्नमयेत् लिङ्गमस्थकं सुषलेन तु ।

तथोऽन्तं पीडयेत् वधीयाङ्गादभिव च ॥ ३१

जरुवदापि कर्तव्यं वाहुभग्रचिकित्सितम् ॥ ३२

शीबायानु विहृत्या प्रविष्टायामधोऽपि च ।

अषट्टावय इन्द्रीय प्रगट्टोऽन्नमयेन्नरम् ।

तथा कुशान् समं दत्त्वा बस्त्रपट्टेन वेष्टयेत् ।

उत्तानं शायदेशैनं सप्तरावमतन्द्रिताः ॥ ३३

इन्द्रियानी समानीय इन्द्रियानी विस इति ।

स्त्रेदधिता स्थिते सम्यक् पश्चात्तौ वितरेन्निषेक् ॥

वातज्ञमधुरैः सर्पिः सिङ्गं नसे च पूजितम् ॥ ३४

अभग्नांशलितान् दत्त्वान् सरक्तानवपेष्टयेत् ।

तदष्टु भग्नात्यस्य शीतैरालेपयेष्टहिः ॥

सिङ्गान्दुभिक्ताः शीतैः सम्भानीयैषपाचरेत् ।

उत्पलस्य च नार्तनं शीरपाणं विधीयते ॥

तीर्थस्य तु भग्नात्यस्य वर्जयेष्टलितान् दित्रान् ॥ ३५

नासा सुन्तां विहृता वा जट्टीं छात्वा अत्ताकाय ।

पृष्ठङ्गासिकायोर्नार्ती विहृत्वा संप्रवेष्टयेत् ।

ततः पट्टेन छं वैष्णव छतवीकं प्रदापयेत् ॥ ३६

leaf ; and a flap of the required size is to be taken from the 'ganda' (goitre or the cheek), to be grafted there, and to support it a metallic frame is to be inserted with two tubes in the nostrils to hold it in position, and then scraping the border (to which the grafting is to be joined).

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भय पर्याप्त बन्नीयात् समं कला छतप्रुतम् ।  
 सदाः वृतविधानस्य ततः पशात् समाचरेत् ॥ १०  
 मक्षुलुहादिना भिन्ने कपालि मधुसपिं चो ।  
 दस्ता ततो निवर्णोयात् समाहृष्ट पिवेद्दृतम् ॥ ११  
 पतनादिभिराताहा शून्यस्त्रङ्गं यद्यतम् ।  
 श्रीतान् प्रदेहान् सेकास्य भिषक् तस्मादयार्थेत् ॥ १२  
 अथ जडोदभप्राणां कपाटघयनं हितम् ।  
 श्रीकृष्णा वस्त्रार्थस्य पक्ष कार्या विजानता ॥  
 यथा न चलनं तस्य भग्नस्य क्रियते तथा ।  
 सन्धेष्वभयतो द्वे हीं तस्य चैकारण्य कौलकाः ॥  
 श्रीकृष्णा वा पृष्ठवं श्री वा व्रजस्यक्षक्योऽस्यात् ।  
 भग्नसविभिन्नोच्चित् विधिनिनं समाचरेत् ॥  
 सन्धीविषरविमुक्तांसु लिङ्गान् लिङ्गान् सदृक्तान् ।  
 उक्तैविधाद्वुल्लासु च सन्धक् प्रक्रतिमानयेत् ॥ १०  
 काञ्चनप्ते पद्मे तु विषमोलघसंहिते ।  
 कापीष्य अलयीहयं ततो भग्नदावरेत् ॥ ११  
 आस्पदीनिर्गीतं शुर्वं व्रणान्मैस्त्र्य मुगाहितः ।  
 सन्धने वा लियो कुर्यात् सब्रैव व्रणमध्यवल् ॥ १२  
 सुकृतसंहिता, चिकित्सानन्, १ ।

and making the surface fresh (to make the grafting successful), the flap is to be carefully sutured. When the grafting has been properly made, a powder made out of *Ptercarpus santalinus*, *Glycyrrhiza glabra* and sulphate of antimony should be sprinkled over the part, and then it should be covered with a lint, which is to be kept moistened with oleum Sesamum (until the complete grafting has taken place). The modern method of rhinoplasty is almost the same, except the two tubes inserted in the nostrils; to hold the metallic frame in position, the metallic frame is made to fit tight the scraped pocket in the nasal bone, and it is provided with a few nodules which are inserted into the nasal bony frame. As to the grafting, the English method consists in taking a flap from the cheek, as devised by Syme, who borrowed it from India; the Italian and the German methods consist of taking the flap from the arm; in osteoplastic rhinoplasty, there is a transplantation of a cartilaginous flap to replace the septum nasi. The very recent method in nasal prosthesis consists of subcutaneous injection of a mixture of solid and liquid paraffin, as introduced by Gersuny in 1910. But as it might partially melt in the body temperature, and thus emigrate and provoke embolism, it has

been improved upon by Eckstein who uses pure paraffin, which melts only at 60 degree centigrade and solidifies after injection, which can be easily performed by Brockaert or Lermoyer's syringe. This has given very satisfactory results).  
*Susruta I. 16. 23<sup>o</sup>4.*

204. नासाप्रमाणं पृथिवीकहाणां पर्वं गट्ठोला त्वदलस्तितस् ॥  
 तेन प्रभावेन हि गस्तपार्द्धादुत्कृत्य बखनवय नासिकायम् ।  
 विलिख्य चाशु प्रतिसन्दधीत तत् साधुवन्मेभिंषगप्रमतः ॥ ०  
 सुसंहितं सम्बगयो यथावन्नाङ्गोइयेनाभिसमोष्य वहा ।  
 प्रोक्षन्व चैनामवचूर्चये च पत्तहृष्टीमधुकाङ्गोऽप्य ॥  
 संकाय सम्बक् पितुगा सितेन तैरिन सिंहे दसहरत् तिक्षानाम् ।  
 सुहुतसंहिता, स्वत्कामन, १६ ।

## VIII. DIETETICS.

"It is apparent that food and drink act as fuel, in the process of metabolism. Vital process is sustained when metabolism is fed by this fuel. Proper dietary nourishes all the bodily elements, improves complexion and enlivens the senses. On the other hand improper dietary provokes disease." *Charaka I. 27. 2<sup>०८</sup>*.

"Vigor, health, longevity and life itself is based on oxidation. Food and drink increase and balance the oxidizing process." *Charaka I. 27. 165<sup>०९</sup>*.

"The physician that does not know the principles of 'Dietetics', can not cure diseases." *Susruta I. 46. 3<sup>१०७</sup>*.

205. प्रत्यक्षफलदर्शनात् तदिन्धनात् स्वस्तरेः स्थितिः । तत् सत्त्वमूर्च्छयति, तच्छर्दारथात्प्रवृद्धबलवर्णं नियप्रसादकरम् । यथोक्तसुषसेव्यमानं । विपरीतमहिताय सम्बद्धते ।

*चरक-संहिता, सूतस्थानम्, २७ ।*

206. वहमारांग्यमायुश्च प्राणाश्वादां प्रतिहिताः ।  
अङ्गपानेष्वग्रज्ञाग्रदीप्ते शास्त्रेऽन्यका ॥

*चरक-संहिता, सूतस्थानम्, २७ ।*

207. नम्ननवदुक्षसभाया भिषजः सम्मानुइति रोगजियहयम् कर्तुं उमर्दीः ॥३  
सुसूत-संहिता, सूतस्थानम्, ४६ ॥

"Every organic body contains five substances as (1) Minerals and Nitrogenous compounds (*prthivi*), (2) Water (*ap*), (3) Hydro-carbons (*tejas*), (4) Carbo-hydrates (*vāyu*) and (5) Ethers (*ākāśa*) ; but it may be called '*pārthiva*, *āpyu*, *taijasa*, *vāyavya* or *ākāśīya* according to the predominance of the substance contained in it.

*Minerals and Nitrogenous Compounds (protein)* : The substance that is gross (*sthūla*), dense (*sāra*), has a high specific gravity (*sāndra*), non-pungent (*manda*), inert (*sthira*), rough (*khara*=sharp-edged crystals by the different inclination of their axes), heavy (*guru*), hard (*kaṭhina*), odoriferous (*gandhabahula*=extractive substances of the meat-protein), slightly astringent (*iṣṭ kāṣīya*) and sweetish (*madhura*), is '*pārthiva*' (organic mineral bodies, and protein which contains about 16 p.c. of nitrogen). This produces firmness (of the bony structure by the minerals), physical vigor (by protein), hardness (of the bony structure by the minerals) muscular tissue-growth (by protein), and particularly it has a high specific gravity.

*Aquatic substance* : The substance that is cool (*sōta*), moistening (*stimila*), soft (*snigdha*), liquid (*manda*), heavy (*guru*), fluidic (*sara*), dense (*sāndra*), smooth (*mrdu*), viscous (*pichchila*), savor-

ry (*rasa-vahula*), slightly astringent, acid or saline (*kaśaya-amla-lavana*) and sweetish (*madhu-ra*), is *āpya'* (juice of vegetable or meat). It is fattening, refreshing, moistening, adhesive (by nature), and excretory (diuretic or sudorific in action).

*Hydrocarbons* : The substance that is calorific (*uṣṇa*), penetrative (*tūkṣṇa*), fine-textured (*sūkṣma*), desiccant (*rukṣa*), escharotic (*khara*), light (*laghu*, in molecular weight), transparent (*viśada*, particularly liquid oil, having forms and containing active principles (*rūpaguṇavahula*), slightly acid and saline (*iṣad amla-lavana*) and pungent (*kaṭu-rasa*), is '*tejasa'* (hydrocarbon, that is fatty bodies which generate heat. It is very likely that the pungent spices were also regarded calorific, as the congestive phenomenon with its concomitant redness, heat and the burning sensation, provoked by its excessive uscs, was mistaken for calorific energy). It causes combustion (oxidation), digestion, cleavage (of the food particles in the alimentary tube), heat, radiation (of heat), round face (corpulence) and bright complexion.

*Carbohydrates* : The substance that is fine, desiccant, rough (in tactile sensation, by different inclinations of the axes as in sugar crystals),

crystalline, tactile, slightly bitter (?), and astringent, is 'vāyavya' (energy-producers, that is carbohydrates). It causes corpulence, agility (muscular energy), relaxation, desiccation (by external application), and motion (as manifestation of muscular energy).

*Ethers* : The substance that is tenuous, rarefied, non-resistant (when a body passes through it), diffusive (a solid body has both size and shape ; a liquid body takes the shape of the vessel in which it is kept : therefore it lacks shape, but quantitatively it does not lack size : but a gaseous body has neither size nor shape, as it diffuses itself in the surrounding atmosphere, if it be not confined in a closed container), transparent, made of diffused particles, tasteless, and soniferous, is 'ākāśīya' (ethers, volatile oils and gas). It causes pliancy, distension and lightness." *Susruta I.* 41.2-7<sup>o</sup>.

208. तत् पृथिव्यसे जीवाय इकाशानां समुदायाद् इत्याभिलिङ्गुतिष्ठलवं स्वभिष्यत्वाको भवतीदं पार्थिवमिदमाप्यमिदं तैजसमिदं वायव्यमिदमाकाशीयमिति ॥ २

तत् खूबसारसान्द्रमस्त्विरखरगुह्यकठिनं गम्भवशुलमोष्टलवाय ' प्रायद्वी मधुरमिति पार्थिवम् । तत् स्वैर्वेष्वलसं धातोपचयकरं विशेषतत्त्वादोगतिसामावमिति ॥ ३

शीत-त्विति - छिप्त - मस्त - गुह्यसारसान्द्रस्तुपि खूबसरसवशुलमोष्टलवायाप्त्वायव्यत्वं अधुररसप्रायमाप्तम् । तत् खेडग्राहादगङ्गे दग्धवन्धनविष्णवहृष्टवरमिति ॥ ४

उप-शीत-त्वादस्तुप्त्वायुपित्वं उपगुह्यमधुलमोष्टलवाय ' खटुपारसप्रायं विशे-

*I.—Carbohydrates.*

*Rice* : "The autumnal rice (*Oryza sativa*) is sweetish, produces energy without (much) heat (a gram of carbohydrate or protein produces 4.1 Calories, while a gram of fat liberates 9.3 Calories), easily digestible, strengthening (dynamogenesis is due to glycogen, which can be most economically produced in the human system by the carbohydrate portion of the diet, and for glycogenesis, carbohydrate in one form or another is the staple indispensable food of almost all the human beings, except a few Eskimos who mostly live on seal-meat and fat, and the primitive Indians of Tierra del Fuego who mainly subsist on shell fish and hunting), sedative, causes slight flatulence (in case of fermentation), fattening (excess of glycogen, produced by the habitual consumption of

वत्तद्वीपं ग्रन्तिकामावस्थिति तैजसम् । तद्दृग्नपथनदारण्टापग्रन्तकाश्च प्रभावर्थ कर-  
निति ॥ ५ ॥

सूक्ष्मद्वच्छुद्यश्चिरलक्ष्मिविशदं स्पर्शवहुतमीचित्तम् विशेषतः ब्रह्मावस्थिति शाश्वतोयम् ।  
तर्हि शाश्वतावदव्यवदग्निविद्वच्छविश्चारचकारनिति ॥ ६ ॥

सूक्ष्मद्वच्छुद्यवायिविद्वच्छविश्चारचकारनिति ॥ ७ ॥ शब्दद्वच्छुद्याकाशीयम् । तत्त्वाहृष-  
ओचित्तिवाच्छवरनिति ॥ ८ ॥

carbohydrate more than the bodily requirement, is at first deposited in the hepatic and the muscle cells; but if it be not used, it is converted into adipose tissues, as a stored energy in case of future needs), is constipative, and leaves very little residue (rice is poor in cellulose ; husked rice contains about 12. 0 water, 7. 12 protein, 1. 0 fat, 76. 8 carbohydrates, 1. 0 cellulose and 1. 0 p. c. minerals)." *Susruta* I. 46. 6 <sup>200</sup>.

"*Barley* : Barley (*Hordeum distichon*) is astringent sweetish, produces energy without much heat generation, acidifying (by fermentation), removes '*kapha*' and '*pitta*', acts as vulnerary like the sesame (oil) and in abscesses (by external application), a daily food, diminishes urinary secretion (oliguria), produces flatulence (in fermentation), laxative having a large residue (3. 8 cellulose), promotes longevity, enhances metabolism, improves memory, voice and complexion, viscous (when barley powder is dissolved or cooked in water), reduces corpulence, adiposis (by increased metabolism),

209. भृता वाय्पतः शोता लघुनाशा वलावहाः ।

पित्राम्बृतः निषेकफा चिन्धन वदास्यवर्णवः ॥ ५ ॥

सुशुद्ध-निषेक, सूक्ष्मान्तरम्, ४६ ।

refrigerent (when drunk internally as a decoction), desiccant (by external application) and is a purifier of blood and of biliary secretion (barley contains about 12. 3 p. c. water, 10. 1 protein, 1. 9 fat, 3. 8 cellulose, 2. 4 mineral matter)." *Susruta I.* 46. 40<sup>10</sup>.

*Wheat* : Wheat (*Triticum sativum*) is sweetish, heavy to digest (when not properly cooked ), energizing, promotes vigor, aphrodisiac, appetizing, fattening, produces energy without much heat generation, sedative, vulnerary in fractures, diuretic and laxative (wheat contains about 12. 0 p. c. water, 11. 0 protein, 1. 7 fat, 71. 2 carbohydrates, 2. 2 cellulose and 1. 9 mineral matter.)" *Susruta I.* 46. 42<sup>11</sup>.

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210.

यवः कषायो नभुरो हिमस्त  
कटर्विं पाके कफपित्तहारी :  
ब्रेषु पथक्षिलवश नित्यं  
प्रवज्जमूदो वह्नवातवशाः ॥  
स्थैर्यांगिमधास्त्रवर्ण लक्ष  
स पित्तक्षतः स्थलविद्येष्वनश्च  
मेदोमदत्तुङ् इरण्डोऽतिवशः  
प्रसादनः शोषितपित्तयोश्च ॥ ४०

सुहृत-स हिता, स्वस्त्रानम्, ४६ ।

211.

गोधूम उक्तो नभुरो गुरुश्च  
वशः लिरः शुक्राद्यचिप्रदश ।

## II.—*Legumes.*

*Legumes* : “Phaseolus mungo (*mudga*), Phaseolus lobatus (*vana-mudga*), Pisum sativum (*kalāya*), Phaseolus aconotifolius (*makuṣṭa*), Ervum lens (*masūra*), Cicer lens (*maṅgalya*), Cicer arietinum (*chanaka*), Pisum arvense (*satīna*), Convolvulus turpethum album (*tripuṭa*), Lathyrus sylvestris (*hareṇu*), Cajan cajan (*udakī*). etc. are the legumes. They are astringent-sweetish, energizing without production of heat, acidifying (in fermentation), productive of flatulence, constipation and oliguria (Legumes hold an intermediate place between carbohydrates and proteids, having nearly 18 to 25 p. c. of vegetable protein-legumin, (soy bean of Soia soja has about 32. 9 p. c. of protein, 18. 1 of fat, 28. 7 of carbohydrates, 4. 9 of minerals), half to one and half per cent of fat, 50 to 60' p. c. of carbohydrates. But unfortunately much of this rich food contents can not be absorbed, as they are confined in the cellulose, and the human stomach lacks sufficient enzymic potency to

विज्ञोऽतिशीलोऽग्निलमित्रहना

सम्बान्धात् द्वेषकरः सरय ॥ ४२

सुश्रुत-स'हिता, स्वस्थानम् ; ४१ ।

burst open the cellulose shell. However, if it be taken in the pure form, enough of it can be assimilated to make it a valuable addition to the dietary)." *Susruta I.* 46. 25-26<sup>212</sup>.

### III.—*Proteids.*

**Meat :** Meat can be had from six classes of animals —(1) Aquatic (*jalesaya*), (2) Marshy (*ānūpa*), (3) Domesticated (*grāmya*). (4) Carnivorous (*kravyāda*), (5) Perissodactyla (*eknasapha*, distinguished from arisodactyla), and (6) Wild (*jāngula*). (Meat supplies the protein needs of the organism, which is about from half to one gram for each kilo body weight per diem, in the most assimilable, tonic and appetizing manner)." *Susruta I.* 46. 53<sup>213</sup>.

**Domesticated Animals :** "The meat of domesticated animals, relieve flatulence, is nourishing, produces '*kapha* and *pitta*', is sweetish in taste, non acidifying in reaction, enhances metabolism and is stimulating.

212. रुद्रवनसुह कलायमकुड - ममूर्मङ्गल्यवणकमतीनिपुटहरेखदकोप्रभृतये  
वदेताः ॥ २५

कवायमधुराः शीताः जटुपाका भृत्यकराः ।  
वदमूवपुरीयाय विशदैभद्राकथा ॥ २६

सुश्रुत-संहिता, सबस्थानम्, ४६ ।

213. असिमया आग्नो यात्वा: क्रमसुज एकशफा आङ्गलाष्टेति अस्मांसद्यग्नीः ।  
सुश्रुत-संहिता, सबस्थानम्, ४६ ।

**Goat :** Goat-meat is oxidized without the generation of excessive heat, is heavy (if old, tough or fatty), fattening, moderates 'pitta' and 'kapha', cures constipation and catarrh (goat's meat is not liked by some for its peculiar odor due to 'hircine', otherwise if the animal is young and the meat is not fatty, it is easily digestible).

**Mutton :** Mutton is nourishing, produces 'pitta' and 'slesma'. is hard to digest (especially if it be of tough fiber or fatty, as the mutton fat has a very high melting point).

**Mutton :** The mutton of the broad-tailed sheep (*medah-puchchha*) is a muscle-builder, and in other characteristics, it resembles the (ordinary) mutton.

**Beef :** The beef cures tuberculosis, respiratory diseases, catarrh, and typhoid ; it is very beneficial to the hard-workers and for those who have good digestion ; it is purifying and relieves flatulence." *Susruta I. 46. 45-89* \*1\*.

214. शाम्या वातहरा: सत्ये हङ्गणः कफदित्ताः ।

मधुरा रसपाकाभ्यां दीपना बलवैना: ॥ ८५ ॥

ग्रातिशोतो गुरुः खिञ्चि मन्दपित्तकफः अृतः ।

हगलस्त्रभिष्ठन्दी तेषां पीतसनाशनः ॥ ८६ ॥

हङ्गणं मासमोरम्बं पित्तश्चेशावहं गुरुः ॥ ८७ ॥

मेदःपुच्छोत्तरं हथमीरभसहयं गुरुः ॥ ८८ ॥

*Venison* : The venison is astringent-sweetish, easily digestible, relieves flatulence and biliousness, oxidizes with rapid heat production, is a cardiac stimulant, and relieves vesical troubles.”  
*Susruta I. 46. 53*<sup>215</sup>.

*Boar's meat* : “Boar's (*Sus scrofa*) meat is sudorific, nourishing, muscle-builder, refrigerant (reflex reaction of perspiration), appetizing, hard to digest (especially fatty and coarse meat) fattening, relieves fatigue, flatulence, and is strengthening.” *Susruta I. 46. 102*<sup>216</sup>.

“The meat of boar and pig is fattening, stimulating, tissue-builder, tonic (removes lassitude), carminative, strengthening, appetizing, sudorific and heavy” 2. 27. 32<sup>216a</sup>.

*Fowls* : “Partridge (*perdix chinensis*) is

शासकासप्रतिश्वाद-विषमज्वरनाश्वानम् ।

श्वात्यविनहितं गृथ्यं पर्ववमनिलापहम् ॥ ८८

सुश्रुत-संहिता, सूत्रस्थानम्, ४६ ।

215. मृगाः कषाया मधुरा लघवी वातपित्तहरात्कीच्चा छद्या वसि-  
 शोधनात् ॥ ५१ सुश्रुतसंहिता, सूत्रस्थानम्, ४६ ।

216. सेदनं छेहणं हृष्टयं हृष्टयं शीतलं तर्पणं गुरु ।

ह्रिष्टयं श्रमनिलहरं वाराहं वलवर्णनम् ॥ १०२

सुश्रुतसंहिता, सूत्रस्थानम्, ४६ ।

216.(a) सेहनं हृष्टयं हृष्टयं श्रमनिलापहम् ।

वराहपित्तं वल्यं रोचनं सेदनं गुरु ॥

चरक-संहिता, सूत्रस्थानम्, १३ ।

restorative, enhances metabolism, astringent-sweetish, is oxidized with pungency, and is a good diet (during convalescence) in acute complicated cases." *Susruta I.* 46-59<sup>11</sup>.

"Snow-partridge (*Tetraogallus himalayaensis*) is slightly heavy, is oxidized with excessive heat production, sweetish, is a muscle-builder, improves memory (by accelerated circulation) and enhances metabolism, tonicises the entire system, is laxative and improves the complexion. Particularly its white variety cures hiccup, respiratory lesion and flatulence." *Susruta I.* 46. 60<sup>11</sup>.

"Chicken is fattening, is oxidized with excessive production of heat, relieves flatulence, builds muscles, improves voice, is strengthening and stimulating ; the domesticated chicken is heavier than its wild variety, and is beneficial in (fermentative) flatulence, consumption, (acid)

217. संचारी दीपनश्वेत कवायनधुरो लघुः ।

लाबः कटुविपाकश सद्विपाते च पूजितः ॥ ५८ ॥

समुत्संहिता, सूत्स्नानम्, ४६ ।

218. ईषदगुरुचमधुरो हस्ती निधायिवर्णनः ।

तित्तिरिः सर्वदोषज्ञो याहो वय प्रसादनः ॥

हिक्कावासानिलधुरो विशेषादगौरतित्तिरिः ।

समुत्संहिता, सूत्स्नानम्, ४६ ।

vomitings, and (chronic malarial) intermittent fever." *Suśruta* I. 46.63<sup>219</sup>.

"Pigeons etc. are astringent-sweetish, desiccant, frugivorous, provoke flatulenee, *pitta* and *slesma*, are oxidized without much heat, produce oliguria and leave a very scanty residue. Of them, *bhedāśi* causes all kinds of disturbances and intestinal decomposition. The wild pigeon is astringent sweetish-saline (in taste) and is heavy. The domesticated pigeon is beneficial in gastrorrhagia, is astringent, stimulating, non-acidifying in reaction, and is heavy. The wild sparrow is sweetish, fattening, increases 'kapha' and is aphrodisiac. The garden sparrow is beneficial in gastrorrhagia, and is a strong aphrodisiac." *Suśruta* I. 46. 65-69<sup>220</sup>.

219. चिन्धीचोऽनिलज्ञा हथः स्तेदस्तरवलावहः ।  
तृष्णः कुमुटो वन्यसंबद्धात्मो गुरस्तु सः ।  
वातरोगचयवनी-विषमज्वरनाशनः ॥ ६३  
समुत्संहिता, स्वखानम्, ४५ ।

220. काशयमधुरा रक्षा: फलाहारा मधुज्जरा: ।  
पित्तझेमधुरा: शीता वज्रमूत्राल्पवर्द्धसः ॥ ६५  
सर्वदोषकरसेवा भेदाद्यौ मलदूषकः ॥ ६६  
काशयसादुलवणो गुरः काशकपीतकः ॥ ६७  
रक्तपित्तप्रशमनः कपायो विशदोऽपि च ।  
विषाके मधुरसापि गुरः पारावतः अृतः ॥ ६८

"Goose, crane, heron, ruddy goose, osprey, teal, duck, pheasant, a variety of crane (*Ardea nivea*), small crane, duck (*Pelicanus fuscicollis*), heron, drake, bar-headed goose (*Anser indicus*), Chinese goose (*Cygnopsis cygnoides*), *Turdus ginginianus*, *Corvus aquaticus*, 4 members of the *Antidæ* family, water cock, *Coccyzus melano-leucus* and the wild goose are called 'plava' (aquatic floating birds) and they are gregarious. They are beneficial in gastrorrhagia, are oxidized without the production of excessive heat, fattening, muscle-builder, relieve flatulence, laxative and diuretic, sweetish, and non-acidifying in reaction. But of them the goose is hard to digest, is oxidised with the production of an excessive heat, sweetish, fattening, improves voice and complexion, strengthening, stimulating, aphrodisiac and carminative." *Susruta* I. 46. 105-107<sup>221</sup>.

*Mollusca* : Conch (*Strombus gigas*), mussel,

'कुलिष्ठो मधुरः शिरः कापयकविर्वर्णः ।

रक्तपित्तहरो वेश्म-कुलिष्ठस्तिशुक्रलः ॥ ५१

मुशुत-संहिता, सूदस्थानम्,

221. इन्द्रधारसक्रीच चक्रवाक-कुरर-कादव्य-कारस्त्रव-जीवद्वीपक-वक-वलाका-  
मुखरोकड्डमरारोहुष्ट-नन्दीमुख-मदगृहकोश-काचाच-मणिकाच-शुक्राच-मुखरायिका-  
कीणाचकाम्बुज टिका-मीवराच-वेतवरच-प्रभुतयः इवाः संचातचारिणः ॥ १०५

oyster, snail (*Helix pomatia*), and large-shelled snail or cockle are called 'kośastha' (mollusca).

*Amphibia* : Turtle, crocodile, red crab (*cancer pagurus*), shore crab (*carcinus moenus*), and porpoise (*Delphinus gangeticum*) are called 'pādi' (footed).

They are sweetish, non-acidifying in reaction, carminative, are oxidized without the production of much heat, fattening, sedative, laxative and increases *kapha*." *Susruta* I. 46.108-110\*\*\*.

*Fish* : "Fishes are of two kinds—fresh-water and marine. " *Susruta* I. 46.112\*\*\*.

"Fresh-water fishes are sweetish, heavy,

रसपित्तहरा: शीता: विष्णा हृष्णा मदज्जितः ।

दण्डमूवपुरीषाच मधुरा रसपाकवीः ॥ १०६

गुड्ढमधुरः विष्णः स्वरवर्षवलप्रदः ।

दंडयः शुक्रखसेषा इंसी वातविकारनुत् ॥ १०७

सुशुत्तसंहिता, सूतस्यानम्, ४६ ।

222. शहशहनस्तुशुतिशम्बूकभज्ज्ञामप्रभृतयः कोशस्थाः ॥ १०८

कूर्च्छकुम्भीरकर्कटकङ्गाचकर्कटकशिशुमारप्रभृतयः पादिनः ॥ १०९

शहशूर्चादयः खादु-रसपाका-मदज्जुदः ।

शीता: विष्णा हिता: पिते वर्षस्थाः द्वैशब्दिनाः ॥ ११०

सुशुत्तसंहिता, सूतस्यानम्, ४६ ।

223. मस्ताक्षु विविधा नादेशः सामुद्राच ।

सुशुत्तसंहिता, सूतस्यानम्, ४६ ।

carminative, hemorrhagic, are oxidized with production of excessive heat, aphrodisiac, fattening, and leave little residue. "Suśruta I.46. 113<sup>224</sup>.

"Sea-fishes are heavy, fattening, sweetish, do not increase 'pitta' excessively, are oxidized with an excessive production of heat, carminative, muscle-builder, and increase 'slesma'." Suśruta I. 46.120<sup>225</sup>.

**Milk** : "There are eight kinds of milk (available for general uses, viz. : cow's milk, goat's milk, camel's milk, sheep's milk, buffalo's milk, mare's milk, woman's milk and elephant's milk. As these animals eat various kinds of food-stuffs, and their milk is the essence of the product of their metabolism (during lactation), therefore the milk is vitalizing, heavy (?), sweet, viscid, refrigerant, fattening, emollient, laxative and demulcent ; so the milk is regarded as the vital fluid (product) of the animal.

224. नादेया मधुरा मक्का गुरवो मारुतापह्नः ।

रक्तपित्तकराशोषा हृष्णाः खिंधात्पवद्वंसः ॥ ११९ ॥

सुश्रुत-संहिता, सूक्ष्मानम्, ४६ ।

225. सामुद्रा गुरवः खिंधा मधुरा भातिपित्तलाः ।

उष्णा वातहरा हृष्णा वर्जस्याः क्लेषवैनाः ॥ १२० ॥

सुश्रुत-संहिता, सूक्ष्मानम्, ४६ ।

As milk is beneficial to the (young) animal (for growth and development), so all kinds of milk are good for the animal life. Only it is counter-indicated in the derangements of '*vāta*, *pitta*, *blood* and *mind*'. It is beneficial in chronic fever, bronchitis, dyspnea, consumption, tuberculosis, cancers, insanity, tymphanites, epilepsy, vertigo, intoxication, hyperæmia, polydipsia, cardiac troubles, vesical lesions, anemia, chronic dysentery, piles, colic, ascites, diarrhoea, leucorrhœa, diseases of the female genital apparatus (gonorrhœa), abortion, gastrorrhagia, fatigue, and pleurisy. Milk is depurant, strengthening, muscle-builder, oxidizer, fattening, restorative, analeptic, delays senility, promotes longevity, vitalizing, stimulating, emetic, laxative, and having the same quality of the bone-marrow, it increases hematogenesis. It is a good diet for the children, the aged, wounded, emaciated, starved, or those exhausted by sexual excess.

*Cow's milk* : Cow's milk is non-salivant, fattening, heavy (?), oxidizer, beneficial in gastrorrhagia, refrigerant, sweetish, non-acidifying in reaction (?), vitalizing and very hypotensive.

*Goat's milk* : Goat's milk possesses the same

properties as cow's milk ; but it is specially beneficial in tuberculosis, is light, restorative and cures dyspnea, bronchitis and gastrorrhagia ; as the goats are of small size, feed upon pungent-bitter substances, drink little water and take constant exercise, their milk is good in all diseases.

*Camel's milk* : Camel's milk is desiccant (?), calorific, slightly saline, of pleasant taste, light, and is beneficial in inflammation, cancers, ascites, piles, intestinal worms, skin lesions and poisonings.

*Ewe's milk* : Ewe's milk is sweetish, fattening, heavy (fat : 6.18), and moderates '*kapha and pitta*' ; it is a good diet in rheumatism and hebetic cough.

*Buffalo's milk* : Buffalo's milk is salivant, sweetish, lowers metabolism (?), somnifacient and induces chills (as the buffalo abounds in marshy places, where the malaria is rampant, the symptoms-complex, especially the chills and the metabolic derangements of malaria have been mistakenly attributed to the buffalo's milk); the buffalo's milk contains more fat than the cow's milk, and is heavier.

*Mare's milk* : Mare's milk is strengthening, beneficial in the rheumatism of the extremities,

of acidulated sweetish saline taste, desiccant and light.

*Woman's milk* : Woman's milk is sweetish, astringent, refrigerant, can be used for irrigation of the nose and the eye-lids, promotes health, is light and oxidizing.

*Elephant's milk* : Elephant's milk is sweetish, astringent, muscle-builder, heavy, fattening, increases vigor, is beneficial to the eyes and is strengthening.

The milk, milked in the morning, due to the cooling influence of the night, and lack of exercise of the animals, is heavy, constipative and refrigerant ; the evening milk, on the other hand, as the animals are warmed by the sun, exercise and respiration, relieves rheumatism and fatigue and is beneficial to the eyes.

Raw milk is salivant and heavy, but if it be boiled, it becomes lighter ( milk if exposed, especially in a tropical country, becomes soon contaminated, and it is a good precaution to boil it before using it ) ; but this does not apply to woman's milk, where it is beneficial when it is fresh. Milk becomes contaminated, if after milking, it be exposed to cool itself ; but if it be too much boiled, it becomes heavy, but retains its tissue-building property.

The milk that is foul-smelling, sourish, discolored, or of perverted taste, or if it be mixed with salt, or coagulated, should not be used.  
*Susruta I. 45. 44-57* ॥

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226. गव्यमाला॑ तदा चीड़मादिको माहित्वा॒ यत् ।

अनायासै॒ नार्यासै॒ करेणुनासै॒ यत् पयः ॥

तत् खनेक्षीषधिरस-प्रसादं प्राप्तं गुह ।

मधुरं पिञ्जिलं शीतं किञ्चन् द्वासा॑ सरं वृदु ॥

सर्वप्राप्यभूतां तजात् सारम् चीरमिहीचते ॥ ४४

तत् सर्वमिदं शीरं प्राप्यनामप्रतिविहं जातिसाम्यात् । वातपित्तशोषितमानस-  
विकारेष्विवदम् । जीर्णं अवकासासाधोषव्यग्रजीवादोदरम् औषधमददाइपियादा-  
हृषकिपात्रुओगवहजीदोवार्थः - शलोदावर्तातिसार-प्रवाहिकायोनिरोगर्भावावरप्रपिन-  
च्यमङ्गमहर्वं पाप्याप्यहं वल्यं हृष्टं वाजीकरणं रसायनं मिथ्यं सम्मानमात्रापाप्यं  
पयःस्थापनमात्रुच्छं जीवनं हंहृष्टं वमनं विरेचनस्तु तुष्ट्यगुणताजीजसो वैरमिति  
वालहृष्टतजोचानां चुद्रवायन्यायामकर्णितानासै पथ्यतमम् ॥ ४५

गोचरैरमनभिष्ठन्दि किञ्चन् गुह रसायनम् ।

रक्षपित्तहरं शीतं मधुरं रसपाकयोः ॥

जीवनीयं तथा वात-पित्तज्ञं परमं चृतम् ॥ ४६

गव्यतुल्यगुणन्त्वाजं विशेषाङ्गोषिष्ये हितम् ।

दीपनं लघुं संयाहि चासकासाम्पित्तगुत् ॥

चाजानामस्यकायतात् कटुतित्तलिषिवणात् ।

नात्यभुपानाह्रायायामात् सर्वव्याधिहरं पयः ॥ ४७

दद्वीचं लवणं किञ्चिदौड़ं स्वादुरमं लघु ।

शोफगुणोदरार्द्धोज्ञं क्रिमिकुष्ठविवापहम् ॥ ४८

चाविकं मधुरं खिञ्चन् गुह पित्तकावहम् ।

पथं वैवलयातेषु कासि चानिलसप्तवे ॥ ४९

*Sour-milk* : "Sour milk of cow is fattening, sweet in reaction (lactic acid in reaction) oxidizer, carminative, depurant (anti-putrefactive), and appetizing," *Suśruta* I. 45. 61<sup>27</sup>.

मधुभिष्यन्ति मधुरं भांहृष्टं वक्षिनाशनम् ।

निद्राकरं शोतकरं गव्यात् खिरधतरं गुह ॥ ५०

सच्चेकशफं वस्त्रं जाह्नावातहृष्टं पथः ।

मधुराम्बरसं वस्त्रं सद्यानुरसं लघु ॥ ५१

नार्यास्तु मधुरं सन्धं कषायानुरसं हिमम् ।

नस्त्राड्योतयोः पथं जीवनं लघु दीपनम् ॥ ५२

इक्षिवा मधुरं इष्टं कषायानुरसं गुह ।

खिर्वं स्थैर्यकरं जीतं चक्षुष्टं वलवर्णनम् ॥ ५३

प्रायः प्रामातिकं चोरं गुह विष्टभि जीतलम् ।

रामौ सोमगुणात्माश्च व्यायामाभावतस्या ।

दिशाकराभितमानां व्यायामानिलसिवनात् ।

बाताशुत्रोमि श्राविद्धं चक्षुष्टसापराह्निकम् ॥ ५४

पयोऽभिष्यन्ति गुव्यांसं प्रायशः परिकोर्चितम् ।

तदेवोत्तं लघुतरमनभिष्यन्ति वै शतम् ।

वर्षयिला स्त्रियाः सन्ध्यमासमेव हि तद्वितम् ॥ ५५

धारोत्तं गुच्छत् चीरं विपरीतमतोऽन्यथा ।

तदेवातिभृतं सन्धं गुह इं हयमुच्यते ॥ ५६

अनिष्टव्यमन्तर्ष विवर्णं विरसत्त्वं यत् ।

वस्त्रं सलवणं चीरं यज्ञं विवर्णं भवेत् ॥ ५७

सुशुत्त-संहिता, सूदस्यानन्, ४५ ।

287. खिर्वं विपाके मधुरं दीपनं वलवर्णनम् ।

बाताशुहं पवित्रं दधि गव्यं रुचिप्रदम् ॥ ५१

सुशुत्त-संहिता, सूदस्यानन्, ४५ ।

*Whey* : "Whey is acidulated sweetish astringent, is oxidized rapidly, light, pungent, oxidizer, antitoxic, is beneficial in (intestinal) inflammation, diarrhoea, chronic dysentery, piles, splenitis, tumors, intermittent fever, polydipsia, vomiting, stomatitis, colic, adiposis, catarrh and flatulence ; it is non-acidifying in reaction (?), cardiac stimulant, beneficial in strangury, adipositis, and is not a tissue builder. *Susruta* I. 45. 77<sup>28</sup>.

### III.—Fats.

*Butter* : "Fresh-churned butter is energizing, calorific (*dipana*) and cardiac stimulant, and is beneficial in chronic dysentery, piles, trismus and anorexia." *Charaka* I. 27. 100<sup>29</sup>.

*Oil* : Sesame oil is slightly astringent, of pleasant taste, minute (of minute fat globules), calorific, diffusive, increases '*pitta*' (*pitta* is regarded as the humor and the seat of com-

228. तक्कं मधुरमज्जं कायानुरसमुच्चीये लघु दद्धमधिदोपनं गरजोकाली-  
सार-यहूषी-पाञ्चूरोगाशः-झीह-गुआरोचक-विषमज्वर-टुक्राच्छहि प्रसिकाश्लभिदःज्वेआणि-  
खहरं मधुरविषाकं दद्धं मूत्रक्षक्षं हव्याप्रश्वसनमहृथक् ॥ ७७

सुशुप्त-संहिता, सूक्ष्मानम्, ४५।

229. संयाहि दीपनं दद्धं न्वनीतं नवोचृतम् ।

यहूष्यर्थोविषाकारम्भमहृत्वादविषाक्तम् ॥

वरक-संहिता, सूक्ष्मानम्, ४६।

bustion energy and heat-metabolism), is laxative and diuretic. It does not increase phlegma, but is the best carminative ; it is energizing, beneficial to the skin, increases fat (*medas*) and heat (*agnivaruddhna*).” *Charaka I.* 27. 137<sup>230</sup>

#### IV.—Vegetables.

*Vegetables* : “The cucumber, (Cucumis sativus), field-cucumber (Cucumis utilissimus), gourd (Benincasa cerifera), water-melon etc. are indigestible, retards digestion (of other foods), refrigerant, savory, phlegmatic, laxative, diuretic, contain potash and are sweetish..” *Susruta I.* 46. 227<sup>231</sup>.

“The lotus root, the lotus, esculent root of the lotus, fibers of the stalk of the lotus, root of *Scripus kysoor*, *Trapa bisponosa* and water weeds are indigestible, arrest digestion and are

230. कषायाशुरसं खादु सूजमुखं व्यवाधि च ।  
पितकं वहविद्युतं न च द्वेषाभिर्वृगम् ॥  
वातझे घृतम् वस्त्रं लच्छं मीधापिवर्वैगम् ।

चरक-संहिता, सूत्रस्थानम्, २७

231. बपुसेव्याइककार्द्धकशीर्णं इनप्रभतीनि ॥ २२६  
गुहविद्यन्धीतानि स्वादूनि कफङ्गलि च ।  
सृष्टमूतपूरोषाणि सचारमधुराणि च ॥ २२७

सुश्रद्ध-संहिता, सूत्रस्थानम्, ४५ ॥

refrigerant ; the stalk, flower and fruit of white and blue water-lilies (*Nymphaea esculenta* and *Nymphaea stellata*) are savory, astringent, refrigerant, and provoke 'phlegma' and flatulence. *Charaka* I. 27. 54<sup>232</sup>.

*Fruits* : "Pomegranate is astringent, non-calorific, oxidizer, appetizing, refreshing and constipative. *Susruta* I. 46. 144<sup>233</sup>.

"Prune provokes excessive flatulence, is laxative and reduces 'kapha and pitta'." *Susruta* I. 46. 169<sup>234</sup>.

"Fig retards digestion, is sweet, fattening, refreshing and indigestible." *Susruta* I. 46. 134<sup>235</sup>.

"Cocoa-nut is indigestible, fattening, moderates 'pitta', sweetish, refrigerant, energizing, refresh-

232. तद्विसशालूकजीवादनकशेषम् ॥  
प्राणाटकमहसोद्याम् गुदविद्विशीतलम् ।  
कुमुदोपलग्नाकास्तु सपुष्पाः सफलाः अृताः ।  
शीताः स्नादुकचायास्तु कफमारुतकोपनाः ॥  
चरक-संहिता, सूतस्थानम्, १७ ।

233. कवाचागुरुषं तेषां दाहिमं नातिपित्तलम् ।  
दीपनीयं दधिकरं हृदयं वर्जीविव्यग्नम् ॥  
सुस्रुत-संहिता, सूतस्थानम्, ४५ ।

234. अत्यधीं बातसं याहि जात्यवं कफपित्तजित् ॥ १६८  
सुस्रुतसंहिता, सूतस्थानम्, ४५ ।

235. विद्विं सधुरं चित्तवं क्षस्तुषं तर्पयं गुरु ॥ १७६  
सुस्रुत-संहिता, सूतस्थानम्, ४६ ।

ing, stimulating and diuretic." *Susruta* I. 46. 184<sup>230</sup>.

*Grape* is laxative, improves voice, sweet, fattening, refrigerant, and relieves gastrorrhagia, febricula, dyspnea, polydipsia, hyperemia and emaciation." *Susruta* I. 27. 146<sup>231</sup>.

#### V.—*Stimulants.*

"Salt is appetizing, digestive, laxative and carminative." *Charaka* I. 27. 146<sup>232</sup>.

*Spices* : "Foeniculum Nigella indica, Ptychotis ajowan, Cumminum cyminum, Coriandrum sativum and the leaf of Piper longum are digestive, oxidizing, carminative, antitoxic (relieves 'kapha') and is deodorant." *Charaka* I. 27. 148<sup>233</sup>.

236. नारिकेलं गुरु छिन्धं पितत्वं स्वादु शीतलम् ।  
बलमासपदं दृष्टं हृष्टं वक्षिष्ठोधनम् ॥ १८४  
सुश्रुत-संहिता, सूतसामग्रम्, ४६ ।

237. तेषां द्राक्षा सरा सर्वां मधुरा छिन्धशीतला ।  
रक्तपित्तजवरद्वास-दृष्टादाहशयापहा ॥ १८५  
सुश्रुत-संहिता, सूतसामग्रम्, ४६ ।

238. रोचनं लवणं सर्वं पाति चं स्वनिष्ठापहम् ॥  
चरक-संहिता, सूतसामग्रम्, २० ।

239. कारव्यः कुचिकाशाजी कावरी भाष्यतुम्बुद् ।  
रोचनं दीपनं वातकफदीर्गन्धनाशनम् ॥  
चरक-संहिता, सूतसामग्रम्, २० ।

*Liquors* : "All acidulated wines cause bili-ousness, increase digestive power, are appetizing, emetic, desiccant, carminative, cardiac stimulant, vesical disinfectant (?), easily oxidized, irritant, are oxidized with liberation of excessive heat, pungent, excitant of the senses, exhilarant, laxative and diuretic." *Susruta* I. 45. 155<sup>240</sup>.

"*New Wine* is salivant, heavy, provokes flatulence, has disagreeable flavor, non-savorous, non-refreshing and irritant.

*Old Wine* has fine aroma, stimulates digestion, is refreshing, appetizing, anthelmintic (or bactericidal), depurant (?), quickly oxidized, desiccant and carminative." *Susruta* I. 45. 179-180<sup>241</sup>.

240. सर्वं पित्तकरं मद्यमस्त्रं दीपनरोधनम् ।  
 मेदनं कफवात्प्रवृद्धयं वस्त्रविशेषधनम् ॥  
 पाके लघु विदार्ढुणं तीक्ष्णमिन्द्रियवीधनम् ।  
 विकासि स्फटविषमूतुं प्रश्नं तस्य विशेषधणम् ॥ १५५  
 सुहृत-संहिता, स त्रृष्णानम्, ४५

241. नवं मद्यमभिष्यन्ति गुरु वातादिकोपनम् ।  
 अनिष्टगम्भि विरसमहृदयस्त्र विदाहि च ॥ १७८  
 सुगम्भि दीपनं हृदयं रोचिणु क्रिमिनाशनम् ।  
 कुट्टखोत्स्वरं जीर्णं लघु वातकफापहम् ॥ १८०  
 सुहृत-संहिता, स त्रृष्णानम्, ४५ :

"The wine that is opaque, irritant, malodorous, insipid, with yeast fermentation, heavy, non-enlivening, new, sharp (with a high percentage of alcohol), oxidized with a great amount of heat, which has been kept in a foul vessel, which has been made with insufficient materials, which has been kept exposed in an open bowl over night, colorless, should not be taken, as well as the wine left over from another person." *Susruta I. 45. 185<sup>242</sup>.*

"Wine is prescribed in emaciation, strangury, chronic dysentery, or for the person who has lost blood ; it is a carminative and a galactagogue. It is beneficial in hiccup, dyspnea, catarrh, bronchitis, constipation, anorexia, vomiting, tympanites, fecal impaction, and flatulence. "*Susruta I. 27. 93<sup>243</sup>.*

242. सान्द्रं विद्याहि दुर्गम्यं विरसं क्रिमिलं गुरु ।  
अहृयं तदेणं तौच्छासुष्णं दुर्भाजनस्थितम् ॥  
अस्तीवधं पर्युषितमत्यज्ञं पिण्डित्वा यत् ।  
तदज्ञं सर्वदा मद्यं किञ्चिक्षेपनु यद्वेत् ॥ १८५  
सुश्रुत-स'हिता, सूत्रशास्त्रम्, ४५ ।

243. छाशानां सत्तासुत्राणां यहस्यर्थेविकारिणाम् ।  
सुरा प्रश्वला वातज्ञी सन्धरक्ताद्येतु च ॥  
हिक्काश्चासप्रतिश्वायकासदशौयहात्की ।  
बन्धानाहृतिवन्धेतु वातज्ञी नदिरा हिता ॥  
चरक-स'हिता, सूत्रशास्त्रम्, १० ।

### VI.-Water.

"The water falling from the clouds is tasteless ( without any distinct taste ), vitalizing ( acts as an ambrosia ), beneficial to life, refreshing, sustaining, circulatory ( entering into every tissue metabolism ), and removes lassitude, fatigue, thirst, intoxication, vertigo, somnolence, sleep and hyperemia.

The water-vapor of the sky falling upon the earth takes the taste of the place where it falls, and the water of the river, rivulet, lake, pond, dam, well, pool, fountain, vegetable sap, subterranean stream, field inundation, and pond in a swampy region covered with algae and filled with water-weeds, is sweetish." *Susruta* I. 45. 2-3<sup>244</sup>.

"The water vapor of the sky falls upon the earth in different ways, viz. : as ( 1 ) rain ; ( 2 ) hail ; ( 3 ) dew ; and ( 4 ) snow. Of them, the rain-water is the best for its lightness. The rain

244. पानीयमान्तरैचमनिहृश्यरसमवत् जीवनं तर्पणं धारणमात्रासजननं अमन्त्रं क्षमपिपासामदमुर्च्छातन्द्रगिदादाहप्रश्नमनमेकाभ्यतः पथ्यतमस्तु ॥ २

तदेवावनीयतितमव्यतम् रससुपलभते स्थानविशेषान्नदी-गद-सरकङ्गवापी-कूप-चुष्ठी-प्रखयधोहितिरकिरदिग्ब-पल्लवादिषु स्थानेष्ववस्थितमिति ॥

सुदुत-स'हिता, सदृश्यानम्, ४५ ।

also comes from ( the vapor of ) two sources—Gangetic ( sweet ) and oceanic ( saline ).” *Susruta* I. 45. 5<sup>215</sup>.

“Of them, rain from the Gangetic ( vapor ) is the best.” *Susruta* I. 45. 5<sup>216</sup>.

*Polluted Water* : “The water swarming with bacteria, polluted by their toxins, or by (human) excreta, decomposed egg or dead body, covered with grasses and ( fallen ) leaves, contaminated or poisoned, or the inundation water of the first rainy season, if bathed in, or drunk by a person, makes him suffer soon from external lesion, ( skin-diseases for bathing ) and internal troubles ( intestinal disorders for drinking ).

The water that contains slime, mud, or is covered with algae, water-weeds and lotus-leaves etc. and in which (the rays of) the sun, (the beams of) the moon, and air ( aeration can not take place ) can not penetrate, and which is distinguished by any smell, color or taste, that water is to be regarded as contaminated.

The contaminated water is marked by six

245. तहान्तरीक्षं चतुर्भिर्धम् । तदयथा—धारं कारं तीषारं वैमिति ।  
तेषां धारं प्रधानं लघुत्वात् । तत् पुनर्द्विषं गाङ्गं सासुद्रच्छेति ।

सुश्रुत-संहिता, सूतस्थानम्, ४५ :

246. गाङ्गं पुनः प्रधानम् ।

सुश्रुत-संहिता, सूतस्थानम्, ४५ :

faults—in touch, appearance, taste, smell, action and reaction Roughness ( due to the presence of sand or grit ) viscosity ( bacterial decomposition especially of the vegetable matter ), warmth ( due to carbonic acid gas ), tooth-sensibility ( due to astringency or any other chemical agent or bacterial product ) are the touch-faults of contaminated water. Mud, sand, slime and colorings ( chlorophyl ) are the appearance faults. Any pronounced taste is the taste-fault.. Foul-smelling is the smell-fault. If, when drunk, the water causes thirst, heaviness ( in the stomach ), colic, and expectoration, it is due to its action-fault. If when drunk, the water takes a long time for its digestion ( passage, absorption and excretion ) and is retained in the alimentary canal, it is the reaction fault. These faults are not found in the water ( that falls upon the earth from condensation of the water-vapors ) of the sky.

*Sterilization of Water :* Water should be sterilized, if of contaminated source, by boiling, warming in the sun, or by throwing into it, red-hot iron-balls, sand and stones. For its deodorization, flowers of *Rotleria tinctoria*, *Michelia champaca*, *Nymphaea cerula*, and *Bignonia suaveolens* should be kept in water over-night.

The water saturated with the fragrance of the flower, should be drunk in a gold, silver, copper, bronze, crystal or earthen bowl. Polluted water, or untimely rain water should be always avoided. He who drinks water not sterilized by boiling etc., is apt to suffer from inflammation, anemia, diseases, indigestion, bronchitis, dyspnea, catarrh, colic, tumor, ascites and other malignant diseases." *Susruta I. 45, 6-11<sup>247</sup>.*

247. कोटशूपुरीषाष्ठ-शक्वकोयप्रदृष्टितम् ।  
दण्डपर्णोत्करयुतं कलुषं विषसंयुतम् ॥  
योऽवगाहेत वर्षासु पिवेद्वापि नवं जलम् ।  
स वाह्याभ्यन्तरान् रोगान् प्राप्नुयात् चिप्रमेव तु ॥ ६ ॥

तत् यत् शेवालपङ्कहृष्टदण्डपश्चापत्प्रभृतिभिरवच्छङ्गं शशिस्थैर्किरणानिलैर्नाभिजुहु-  
गन्धवर्णं रसोपदृष्टस्तद्यापन्नमिति विद्यात् ॥ ७ ॥

तस्य स्पर्शरूपरसगन्धवीर्यविपाकदीवा: षट् सम्बन्धिति ॥ ८ ॥

तत् खरता पैच्छ्लयनीषाणं दक्षयाहिता च स्पर्शदीवा: । पङ्कसिकताशेवालपङ्क-  
वर्णता रूपदीवा: । व्यक्तरसता रसदीवा: । अनिष्टगन्धता गन्धदीवा: यदुपयुक्तं दण्डा-  
गीरवश्चकफसिकानापादथिति स वीर्यदीवा: । यदुपयुक्तं चिरादिपच्छते विष्टभ्रुतिति  
वा स विपाकदीवा इति । त एते आन्तरिके न सन्ति ॥ ९ ॥

व्यापनानामिक्षकयनं सूख्यांतप्रतापनं तपायः पिण्डसिकतालोडाणां वा निर्वायणं  
प्रसादनस्त्वं कर्त्तव्यं, नागचम्पकोत्पलपाटलापुष्पमभृतिभिराधिकासनमिति ॥ १० ॥

सीबर्णे राजते ताक्षे कास्ये मणिमधीरपि वा ।  
पुष्पाकासं भौमे वा सुगन्धि सखिलं पिवेत् ॥

*Pure water* : "The water that is without smell, distinct taste, that quenches thirst, that is pure, cool, transparent, light and refreshing, is to be regarded as 'pure water'."

*Suśruta I. 45. 13<sup>24</sup>.*

व्यापनं वर्जयेत्तिष्ठं तोयं यशाप्यनार्चवम् ।

दोषसञ्जगनं स्त्रे तत्त्वाददीताहितनु तत् ॥

व्यापनं सलिलं यस्तु पिवतीहाप्रसाधितम् ।

श्वयुं पाञ्चुरोगस्तु लग्नदोषसविपाकताम् ॥

चासकासप्रतिश्वाय-ग्लग्नुओदराणि च ।

अन्यान् वा विषमान् रोगान् प्राप्तु यात् चिप्रमिव च ॥ ११

सुशुत-संहिता, सूत्रस्थानम्, ४५ ।

248. निर्गन्धमव्यक्तरसं दृश्यान्नं शुचि शीतलम् ।

पश्चां लघु च हयस्तु तोयं गुणवदुच्छते ॥ १२

सुशुत-संहिता, सूत्रस्थानम्, ४५ ।

## **IX. HYGIENE.**

*Hospital* : "By an expert architect, a large house should be built ; it should be strong, but not drafty, except the current of air shall pass in one direction ; it should be so built that one can easily move about within it ; it should be built on an elevated place (having nothing higher than it in the locality), and within, it should be free from smoke, sun (exposure to the sun was regarded injurious ; its disinfectant and sterilizing property was not understood), dust, noise, (sensual) touch, (exciting) ocular impressions, (spicy) taste, and (penetrating) smell (that is, whatever excites the nerves and disturbs the nervous quietude) ; and it should be provided with staircase, mortar, pestle, toilet, bath-room and kitchen.

There attendants (interns) for nursing the sick, should be appointed, who are of good character, are pure (free from any disease), obedient, clever, kind-hearted, fit for any kind of work (associated with nursing hospital

duties), expert in cooking, in bath-attendance, massage, capable of lifting and putting the sick into bed, and who do not show unwillingness for any kind of work. There experts should be engaged who are well-versed in singing, music, (in recitation of) prayers, poems, hymns, stories, history and contemporary events (for the distraction of the mind and entertainment of the sick).

There should be also kept (in the enclosure) *Tetraoperdix himalayensis*, *Galloperdix spadiceus*, hare, stag (*Cervus elaphus*), black deer, black-tailed deer (*Cervus cashmirianus*), *Dama platyceros*, and sheep. As well as gentle, milking cows with calves, free from diseases should be kept, and for them feed, sleeping places (stable) and drinking water should be provided.

There should be also cistern, pail, tub, cask, keg, pitcher, jar, ewer, platter, dipper, cooking-pot, double-boiler, bandage, thread, cotton, animal thread (horse-hair for saturation), a comfortable bed with all accessories, jug, spittoon, and all that are necessary for leaning (easy chair), sitting, (for the application of) ointment, sweating, massage, emplastrum, fomentation, embrocation, emetics, sedatives,

vulnerary .. enemata, oily enemata, errhines, urination and purgation." *Charaka I.* 15, 5-9<sup>149</sup>.

*Qualifications of a Surgeon* : "For the practice of operative surgery, a physician has to get the *license* from the king, and for this he has to acquire a thorough knowledge of the medical science and surgery, must have keen observation and experience of operations (under a licensed preceptor or in a hospital); and before an operation, he has to pair his nails (to prevent sepsis, and to carry pathogenic

249. दृढं निवातं प्रवातैकदेशं सुखप्रविचारमनुपत्यकं धूमातपरजसामनभिगमनीयमनिष्टानास्त्र शब्दस्पर्शसकृपणम्बाणां शोपानोद्भवल मूषलवशः स्थानवानमूमिमहानसीपेतं वाक्तविद्याकुशलः प्रशस्तं गृहमेव तावत् पूर्वसुपकल्पयेत् ॥

ततः श्रीलग्नीचानुरागदाद्यप्रादचिक्षेयोपद्धारामुपचारकुशलान् सर्वकर्मान्मु . पर्यावदातान् सू पौद्वपाचक-ज्ञापक-संवाहकोत्यापक-सम्बेशकीषधयेषकांश्च परिचारकान् सर्वकर्मस्खप्रतिकूलान् । तथा गीतवादित्रिक्लापक - श्लोकगायाश्वायिकेतिङ्गासपुरुष-कुशलानभिप्रायद्वाननुभवांश्च देशकालविदः परिषद्यांश्च ।

तथा लावकपिङ्गलशशहरिणे नकालपुर्वकमृगमाद्वकोरभान् । गाज दीग्रीं श्वेतउत्तीमनातुरां जीवइत्वां सुप्रतिविक्षितदृश्यशरणपानीयान् ॥

अलपादाचमनोदकोषमणिकपिठरघटकुम्भी कुम्भ कुण्डशरावदर्ढीक परिपचनमन्धान चेलस तूकार्पासोर्णदौनिच शयनासनादौनि शोपन्वक - भृङ्गारप्रतियहाणि सुप्रयुक्तास्तरणोत्तरप्रक्षदोपधानानि खायाश्वयाणि सम्बेशनोपवेशनसेइस्तेदाभ्यङ्ग प्रदेह-परिषेकागुणीपलबनमविरेचनास्थापनागुणासनशिरोविरेचनमूलोचारतु खानि ॥

चरक-संहिता, सूतस्थानम्, १५ ।

germs and spread infection from patient to patient), to cut short his hair (shaving for the same purpose), become purified (free from any disease, and disinfected) and shall put on (washed, disinfected) white robes, (and shall go to the operation) with umbrella (on his head), stick in his hand, sandals (in his feet), robes not highly raised (gracefully attired), having pleasant speech, uprighteous conduct, friendly to all living beings, and succor of the good."

*Susruta I. 10. 2<sup>25</sup>*.

### I.—Dietetic Hygeine.

"Desiccated (for losing flavor and savor), or decomposed meat (to prevent ptomaine poisoning), or meat from a deceased animal (to prevent the infection of the pathogenic germs of the disease from which the animal has died), or killed by poisoning, or by a venomous snake, or by an instrument which has been covered

250. अधिगततन्त्रे शोपासिततन्त्रार्थेन दृष्टकर्मणा कृतयोग्येन शास्त्रं निगदता  
राजानुज्ञातेन नीचनख्वरोमा शुचिना शुक्रवस्त्रपरिहितेन स्फवता दशहस्रेन  
शोपासत्के नानुज्ञतवेशेन सुमनसा कल्याणाभिव्याहारेणाङ्गुहकैन वस्त्रभूतेन भूतानां  
सुसहायता देयेन विशिखानुप्रवेष्टव्या ॥ २

with poisons, too old (the meat of an old animal is not only tough and unsavorous, but it also contains an excessive amount of metabolic wastes, due to the deficiency of glandular secretions and incomplete oxidation), or too young (the meat of a young animal contains an excessive amount of purine bodies, and extractives are not yet formed, which exert a tonic effect on the organism)." *Suśruta I. 46. 129*<sup>251</sup>.

*Evil Effects of Over-Nutrition* : Any one who with sedentary habits, indulges in fatty, sweet, heavy, viscid foods, new rice, new wine, meat of animals of marshy region, or aquatic creatures, milk, and milk-products, sugar-preparations, and cakes excessively, is subject to diathesis of various lesions, and if he does not take precautionary measures against them, he suffers from diabetes, pruritus, eczema, impetigo, jaundice, fever ; skin diseases, hyperacidity, strangury, anorexia, somnolence, impotence, adiposis, lassitude, foul-emanation from the body, encrusting (calcification) of the vascular system,

251. गुरुक्याधिविषसपं हतदिग्धविद्धजीणं कृशबालानामसात्मकारिणा मांसाङ्ग-भृष्याणि ।

intellectual fatigue, enervation, ascites and other diseases." *Charaka I.* 23. 2 <sup>232</sup>.

"A stimulant taken in proper dose increases the strength and weight of the body, but taken excessively, it reduces the body-weight (by inducing hyper-metabolism )." *Charaka I.* 22. 25 <sup>233</sup>.

*Seasonal dietetic variations* : "He who understands and follows the hygienic and dietetic regulations for each season, by his seasonal vari-

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252. सन्तप्यति यः क्षिरधै मंधुरैगुण्डिक्षिणैः ।  
नवाद्वै नंवमद्वै च भासैयान् यवारिजैः ॥  
गोरसैर्गीड़िकैश्चान्यैः पिण्डकैश्चातिमावशः ।  
चेष्टावैषी दिवाखप्रश्वासमसुखे रतः ॥  
रोगास्त्वयोपजायन्ते सन्तप्य एनिमित्तज्ञाः ।  
प्रभेहपिङ्गकाकोठकाख्यु-पाख्युमयज्वराः ॥  
कुष्ठाव्यामप्रदोषाच्च मूत्रकाञ्चनमोरोचकः ।  
तन्द्रा क्लेव्यमतिस्थौल्यमालस्य गुरुगावता ॥  
इन्द्रियकोत्सा लेपो बुद्धेमोहः प्रमोक्षकः ।  
शंशाश्च वै विधाशान्ये शीघ्रमप्रतिकुर्वन्तः ॥

चरक-संहिता, सूत्रशास्त्रम्, २३ ।

253. बलं पुष्टुपलश्चय काश्यं दोषविवर्जनम् ।  
लक्षणं हंहिते स्थौल्यमति चात्यर्थंहंहिते ॥

चरक-संहिता, सूत्रशास्त्रम्, २२ ।

ation of diet improves his complexion and increases his vigor." *Charaku I 6. 2 २५३a.*

*Seasonal variation of food* is conducive to health and vitality. In the summer one does not need so much fat as in the winter, as the caloric needs of the organism is much less, owing to the less radiation of heat from the body surface to the surrounding atmosphere. And as the cold air contains more oxygen, the increased oxygen-intake naturally enhances metabolism, and therefore one has in the winter better appetite, and can digest a large quantity of meat and other nitrogenous food, which in the summer may easily cause gastro-intestinal troubles. Carbohydrate needs of the body are also increased, as to keep the body warm, one is apt to move and to take exercise, which naturally consumes more glycogen than in the summer, and therefore an increased intake of carbohydrates becomes necessary. "Due to the contact of the cold air, digestive fire is confined, and consequently its vitality (metabolism) is increased; for this reason in

253.(a) तस्याशिताद्यादाहाराहलं वर्णश्च वर्तते ।  
तस्यनुसात्मा॑ विदितं च दाहारव्यपाशयम् ॥

चरक-संहिता, सूतस्खानम् ६ ।

winter, one can digest much more heavy stuffs ( than in the summer )." *Charaka I. 6. 9* \*\*\*.

*Not to eat rapidly* : Do not eat too rapidly. For if eaten too rapidly, the ingesta does not give adequate savor, nor is it properly fixed ( masticated and saturated with salivary ferments), and is abnormal in its course in the alimentary canal, and its normal reactions are not perceived ; therefore one should not eat too rapidly." *Charaka III. 1. 19* \*\*\*.

*A lean person has more vitality than a fat person* : "To make a fat person lean, indigestible food (which is insufficiently assimilated, but only given to satiate hunger) and fasting should be prescribed. And to make a lean man fat, easily digestible food to satiation should be given." *Charaka I. 21. 16* \*\*. "But though both leanness and fatness have their inconvenience, between them, leanness is preferable, for in a

254. शंते शीतानिलस्यर्थं संक्षेपो वलिमां बली ।

यज्ञा भवति इमलो मात्राद्वयगुणमः ॥ चरक-संहिता, सूक्ष्मस्थानम्, ६ ।

255. नातिद्रुतमशीयात् । अतिद्रुतं हि सुज्ञानस्य तत्क्षेत्रसादनभोजनसाप्रतिष्ठानं भोज्यदोषसाहु खोपलभिष न नियता, तस्मान्नातिद्रुतमत्रीयात् ।

चरक-संहिता, विमानस्थानम्, १ ।

256. गुरु आतप्त्यस्वेऽस्यूलानां कर्षणं प्रति ।

लग्नानां चूङ्घासारेण्टु लघु सन्तप्त्यस्वेऽयत् ॥ चरक-संहिता, सूक्ष्मस्थानम्, ११ ।

disease, a fat individual suffers more ( accumulation of fat in the body is due to fundamentals : ( 1 ) Either excess of food is taken, especially carbohydrates, beyond the bodily needs, and with good digestion, the surplus of converted glycogen above the current expenditure is stored in the body as fat ; to a moderate extent, this is very becoming, as it beautifies the form of the body ; but in excess it is apt to interfere with the action of the heart and other vital organs by pressure as well as fatty infiltration. However, the dyspeptics do not get fat and remain lean with excessive amount of food, for the ingesta can be only partly absorbed, due to deficiency, quantitatively and qualitatively, of digestive enzymes. ( 2 ) Fatty accumulation and degeneration takes place in hypo-metabolism, due to glandular deficiency as in myxedema. On the other hand, hypermetabolism causes gradual emaciation. As vitality is related with metabolism, so leanness not associated with nutritional insufficiency or wasting diseases, has more resisting power against pathogenic micro-organisms )." *Charaka I.* 21.

**13<sup>\*\*\*a</sup>.**

256. (a) स्त्रीलक्षकाश्चेव वरं काश्चं समोपकरणी हि ती ।

यद्युभौ व्याधिरागच्छेत् स्त्रूलभिवातिपीडयेत् ॥

चरक-संहिता, सुवस्थानम्, ११ ।

*Mental excitement interferes with Digestion :*

“Worry, sorrow, fear, anger, sadness, perplexity and vigilance ( sleeplessness ) interfere with digestion, even if the food be good and taken in right quantity ( mental excitement arrests the digestive secretions, and by raising the blood pressure by excessive secretion of adrenalin, the sympathetic nervous system becomes irritated ).”  
*Charaka III. 2. 6*<sup>257</sup>

*Mouth Hygiene :* “After eating, one should repeatedly gargle, and wash out the mouth ( to wash out the food particles that may be in the buccal cavity, to prevent their harboring of micro-organisms which cause decomposition and foul odor of the mouth ).” *Susruta I. 46.* 520<sup>258</sup>. “Food particles sticking in or within the (crevices of) teeth, should be taken out slowly with tooth-picks ; for otherwise they cause foulness of the mouth ( The negligence of these two simple oral hygienic rules, is spreading fast in India, as in

257. मात्रयाप्यभवहसं पथं चात्रं न जार्यति ।

चिन्नाशीकभयक्रोधदुःखमोहप्रजागरैः ॥

चरक-स'हिता, विमानस्थानम्, २ ।

258. प्रचालयेदहिरास्यं भुजानस्य सुहर्मुहः ।

सम्रत-स'हिता, दुवस्थानम्, ४६ ।

Europe, the *Dental Caries*).” *Susruta I.* 46.  
525<sup>59</sup>.

*Foods to be avoided* : “The food that is discolored, contaminated, left over ( from the plate of some one else ), mixed with pebbles, grass or similar substances, repulsive in appearance, kept over night, insipid, or decomposed, should not be taken ; nor the food that is cooked for a long time ( vitamine is destroyed by over-cooking or cooking at a high temperature ), is hardened ( digestive ferments can not penetrate through hardened masses ), cold ( the injesta has to be heated to the body temperature before the digestive ferments can act energetically upon them and they can be absorbed ), cooked again, porridge having uneven cooked grains, and what is cooked at a high temperature.” *Susruta I.* 46.  
518<sup>60</sup>.

## II.—General Hygiene

*Not to interfere with the natural call of Nature* : “An intelligent person should not

259. दन्ताकरणतचाक्षं शोधनेनाहरेच्छनेः ।  
कुर्यादनाहतं तस्मि सुखसानिष्टगम्भताम् ॥ ५२५  
मुमुक्षुतस्य हिता, सूक्ष्मस्थानम्, ४६ ।

260. अचोक्षं दृष्टसुच्छिद्धं पाणाणदप्लोऽवत् ।  
हिद्धं व्युषितमस्तादु पूर्णि चार्ण विवर्ज्येत् ॥  
मुमुक्षुतस्य हिता, सूक्ष्मस्थानम्, ४६ ।

retain (interfere with the passage by the voluntary contraction of the muscles) feces, urine, intestinal gas, vomiting, sneezing, yawning, hunger, thirst, tears, sleep or the fatigued breath ( carbon dioxide )." *Charaka I. 7. 2<sup>o</sup>1.*

*Periodic Cleaning of the System* : "In the spring, in the rainy season, and the autumn, one should cleanse his system. First he should use ointment, then sweating, and after that emetics and purgatives. Later enemata and errhines should be given ( The periodic flushing of the intestines by enemata or purgatives, is now recognized by all as a good hygienic prophylaxis. In weakness of the kidney, Turkish bath twice or thrice a year is also very desirable, to throw out of the system the accumulated toxins through the skin, which the kidney has failed to eliminate or as a relief to the over-worked kidneys )." *Charaka I. 7. 35<sup>o</sup>2.*

261. न वेगान् धारयेद्वैमान् जातान् सूक्ष्मपुरीषयोः ।  
 न रेतसो न बातस्य न वस्याः चवद्यो नैच ।  
 नोद्धारस न जूऽभाया न वेगान् चतुर्पिपासयोः ।  
 न वायस्य न निद्राया निःशासस श्रमिण च ॥  
 सुक्ष्मतस्तु हिता, सूक्ष्मस्थानम्, ४ ॥

262. माधवप्रथमे माषि नभस्य प्रथमे पुनः ।  
 सहस्र प्रथमे चेव इरयेहोषसच्यम् ॥  
 चरक-स'हिता, सूक्ष्मस्थानम्, ४ ॥

*Physical Exercise* : Exercise is the exertion to invigorate and to increase the strength of the body ; one should take physical exercise measuredly. For it induces lightness, agility, vigor, endurance, removes flatulence, and increases metabolism. But if it be done in excess, it brings about lassitude, fatigue, spermatorrhea, gastrorrhagia, dyspnea, bronchitis, fever and vomiting". *Charaka I. 7. 24-26*<sup>23</sup>.

*Excess to be avoided* : "An intelligent person, even if necessary, should not indulge in excess of exercise, laughing, speaking, travelling, sexual intercourse and vigilance." *Charaka I. 7. 27*<sup>24</sup>.

"A person who takes regular exercise, and eats after his previous meal has been digested, and takes barley and wheat, does not suffer from

263. अरीरचे दा या चे दा स्वैर्यार्थ बलवहिनी ।  
देहव्यायामसंख्याता मावया तां समाचरेत् ॥  
लाघवे कर्मसामर्थ्यं स्वैर्ये लोकसहिष्णुता ।  
दोषव्योगप्रिहित्वा व्यायामादुपजायते ॥  
श्रमः लभः अथस्त्वा रक्तपिण्डं प्रतामकः ।  
अतिव्यायामतः कासो ज्वरम्भिर्य जायते ॥

चरक-संहिता, सूतस्थानम्, ७ ।

264. व्यायामहास्यभाष्याभ्यवाप्यधर्मप्रजागरान् ।  
नोचितानपि सिवेत तु द्विमानतिमात्रया ॥

चरक-संहिता, सूतस्थानम्, ७ ।

over-eating, and he loses his adiposis. "Charaka I. 23. 10<sup>2</sup><sup>8</sup>.

*Purgatives and Purgation* : "The best of root purgatives is Ipomoea turpethum, of the barks—Symplocos racemosa, of the fruits—Terminalia chebula, of the oils—Ricinus communis ( castor oil ), of the juice—Cleome pentaphylla, and of the milky exudations—that of Euphorbiæ antiquorum." *Susruta* I. 44. 2<sup>2</sup><sup>6</sup>.

"The effectiveness of purgation is marked by subsidence of weakness, emaciation ( loss of body weight ), fatigue and the course of the disease, the improvement of the heart's action, clearness of complexion, normal appetite and thirst, normal inclination for evacuation of feces and urine, improvement in the sense perceptions and

265. व्यायामनित्यी जीर्णाशी यवगोधभभोजनः ।  
सन्तप एकतैदीषैः स्थीख्यं मुक्ता विस्तृते ॥  
चरक-संहिता. सूक्ष्मानम्, २३ ।

266. अरुणाभं त्रिहृष्ट्यालं शेषं मूलविरेचने ।  
प्रधानं तिलकस्वद्दु फलेष्वपि हरीतकी ॥  
तैलेष्वे रक्षजं तैलं खरसे कारवीह्रिका ।  
सुधापयः पयःसूक्तमिति प्राधान्यसंयहः ॥  
सुश्रुत-संहिता, सूक्ष्मानम्, ४४ ।

the mind, passage of the intestinal gas, and the increased metabolism." *Charaka I.* 16. 3<sup>267</sup>.

*Do not sneeze before covering your mouth :* "Without covering your mouth, do not yawn, sneeze or laugh ( to prevent the spreading of pathogenic germs, especially the Bacilli tuberculosis )." *Charaka I.* 8. 17<sup>268</sup>.

*Treatment against Poisoning :* In the first poisoning, the patient should be made to vomit ( the poison that has been ingested by an emetic ) and then after giving cold water ( to dissolve the poison that may be sticking to the wall of the alimentary canal ), a detoxicant mixed with butter and honey should be given ( to neutralize the toxins, and to make them comparatively innocuous by chemical combinations )" *Susiruta V. 2.* 25<sup>269</sup>

*Treatment against venomous snake-bite :*

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267. दौर्बल्यं लाघवं व्यानिर्वाधीनामत्पता रुचिः ।

मृदण्ड शुद्धिः चूतृष्णा काषे वेगप्रवर्तनम् ॥

उज्जीन्द्रियमनःशुद्धिर्महतस्यानुलोभता ।

सम्यग्विरिक्तलिङ्गानि कायाग्ने यानुवर्द्धनम् ॥

चरक-स'हिता, स वस्थानम्, १५ ।

268. नासं इत्तुखे जृआं चवयुं हासं वा प्रवर्तयेत् ।

चरक-स'हिता, स वस्थानम्, ८ ।

"If the arm or leg is bitten by a snake ( if it be subcutaneous, the poisoning is slow, but if intravascular, it is rapid ), a tight ligature should be made about four fingers' breadth above the wound, to prevent the poison flowing upward ( with the blood or lymph ) by cord, leather-band or tree bark ( tourniquet, to compress the blood and the lymphatic vessels). Where tight ligature is not possible, free incisions should be made near the bite ( to drain out the poisoned blood and the lymph) and the affected area cauterized (preferably by a liquid caustic, permanganate of potash—3 p. c. solution—which can penetrate deep into the tissues quickly). Suction ( by hygroscopic calcined stones which suck the fluid with the poisonous principles ), incision ( to drain out the poisoned blood and the lymph ) and cauterization ( to destroy the poisonous principles and the poisoned area ) are always applicable ( after tight ligature ). *Susruta* V. 5. 2<sup>o</sup>". Injection of polyvalent antivenom serum has proved very promising.

269. प्रथमे विषवेणे तु वान् शीताम्बुसेवितम् ।

अगदं मधुसर्पिंभ्यों पावयेत समायुतम् ॥

मुश्त-म'हिता, कल्पस्थानम्, १ ।

270. सर्वे रेवादितः सर्वे : शाखादट्टस देहिनः :

दंशसोपरि वज्रीयादरिष्टाशतुरङ्गुलं ॥

### *III. Sexual Hygiene.*

*Physical Maturity* . "An intelligent physician should know that man at 25 years of age and woman at 16 attain at their ( physical ) maturity with full ( organic ) development." *Susruta I. 35. 9<sup>271</sup>.*

"He who cares for longevity should not have sexual intercourse, before he is 16 years old, or after he is 70 ( Though a boy at 16 has his spermatozoa developed and is capable of reproduction, yet he needs to conserve and utilize the spermin up to the age of 25 for the development of his body and mind ; in old age, the tension of copulation is liable to cause rupture of the calcified and friable blood-vessels )." *Charaka VI. 2. 60<sup>272</sup>.*

प्रोतचम्बान्तवन्काना॑ स्वदुनान्यतमेन च ।  
न गच्छति विषं देहमरिष्टाभिनिंयारितम् ॥  
दहेहं शमयोत्कृत्य यत् वस्त्रो न जायते ।  
आचूषणक्षे इशाहाः सर्वत्रैव तु पूजिताः ॥  
सुशृत-संहिता, कल्पस्थानम्, ५

271. पञ्चविंशी ततो वर्ते पुमान् नारो तु वोङ्गशी ।  
समत्वागतवोर्यो तो जानायात् कुशको भिषष् ॥ ८  
सुशृत-संहिता, स्वस्थानम्, ३५ ।

272. नन्ते वे योङ्गशाहवांत् सप्तव्याः परतो न च ।  
आयुष्मानो नरः स्त्रीभिः संयोगं कर्तुमहृति ॥  
चरक-संहिता, चिकित्सस्थानम्, १ ।

*Tuberculosis increases sexual desire* : "If a tuberculous patient (consumptive) gradually loses his strength, and his expectorations increase, yet he is fond of sexual intercourse, the disease will lead him to his death (It is well known that the tubercular patients become very sexually inclined ; it is very probable that the rich phosphorus contents of the Bacillus tuberculosis become liberated in the disintegration process as a reaction of the organism, and this circulating with the blood acts as an aphrodisiac, and consequently sexual erethism is one of the most distinguished characteristics of this disease)." *Charaka VI. 3.* 5<sup>273</sup>.

*Sexual intercourse forbidden* : "Do not have sexual intercourse with a menstruating woman (there seems to be a universal prejudice against intercourse with a menstruating woman ; it is possible that the presence of blood has been regarded by the primitive man as impure, or unesthetic ; it is probable, however, that the motive is more utilitarian, as many of the religious observances, regulations and injunctions are certainly based on principles of

273. बलवृद्धोयते यस्य प्रतिश्वायस्य वृद्धते ।

तस्य नारीप्रसन्नस्य श्रीबोद्धामायोपज्ञायते ॥

चरक-स'हिता, इन्द्रियसागरम्, ५

hygiene or economic considerations ; in apparently cured and neglected old gonorrhea, the gonococci might still live in the upper tract, and may be dislodged with the flow of the menstrual blood, and cause urethritis to the man with whom she may have copulation, while in other times it might remain entirely innocuous ; a menstruating woman on her part is rather sexually inclined during that period, and would be much relieved of turgescence by the embrace), with a diseased, or unclean woman (for hygienic reasons) or with one whose vagina is narrow (vaginismus), whose beauty does not appeal (rouse the senses), or whose conduct is repulsive or who is artless, homely, or one who goes with other men (thus can be infected and spread the disease) ; nor go with another man's wife ; nor practise bestiality, or unnatural vices (sodomy and pederasty )." *Charaka I. 8.*  
*25<sup>274</sup>.*

*Aphrodisiac* : "A pretty, youthful, well-formed, charmingly attired, willing and well-educated

274. न रजस्वां नातुरां नामेषां नाशकां नानिष्टक्षपाचारोपचारां नादच  
नाकामां नाव्यकामां नाव्यस्त्रियं नाव्ययोनिं नायोनी अभिगच्छेत् ।

चरक-संहिता, सुवस्थानम्, ८।

woman (wife) is the best aphrodisiac (in impotence)." *Charaka* VII. 2. 5<sup>25</sup>.

*Impregnation* : "In the (sexual) congress of man and woman, by the nervous tension heat (tumescence) is generated. The heat and (vaginal) secretion provoke the discharge of the semen, and which unites with the ovum (*ārttava* is a vague expression ; but it is certain that it meant more than menstruation blood, as it could not exist after menstrual flow ceased ; perhaps it was an indistinct conception of the ovule which when it becomes ripe, ruptures the Graafian follicle in which it is enclosed and causes menstruation). Then the united sperm and the ovum (the fecundated ovum) reach the uterus." *Susruta* III. 3. 3<sup>26</sup>.

"As the germination (of a seed) takes place by the combination of proper season, field, moisture and seed, so pregnancy is developed

275. सुर्या योवनस्या या सच्चणैर्या विमुषिता ।

या वश्या शिक्षिता या च सा स्त्री द्वयतमा मता ॥

चरक-संहिता, चिकित्सानम् २ ।

276. तद स्त्रीपुरुषोः संयोगे तेजः शरोराशायुरुदीरयति । तत्तेजोऽनिष्ट-  
सन्धिपाताञ्छुकं अुतं योनिमभिप्रतिपद्यते संस्कृते चार्षवेन । ततोऽप्यषोमसंयोगात्  
संस्कृतमानो गर्भो गर्भाशयमनुप्रतिपद्यते ।

सुशूत-संहिता, शारीरस्थानम्, २ ।

by their proper combination ( *rtu* = proper season standing for the first 12 days after menstruation ; *kṣetra* = field for uterus ; *amvu* = moisture for ovum ; *vijā* = seed, for sperm, i. e. for spermatozoon)." *Suśruta III. 2. 33*<sup>277</sup>.

*Heredity* : "The child inherits the characteristics of the parents acquired by them under the influence of diet, behaviour and (physical and mental) exertions, during their copulation (in which the impregnation takes place. Though hereditary transmission can not be explained by such a simple formula, yet it is undeniable that the germplasms must be under profound impression of the physical and the mental state of the parents in the time of fertilization. An irritable spermatozoon either by alcohol, or by the morbid condition of blood, is very apt to create the same diathesis in the offspring)." *Suśruta III. 9. 63*<sup>278</sup>.

"He who abstains from meat and wine, and

277. भृवं चतुर्षां सामिन्यादग्रमः स्वाहिधिपूर्वकः ।  
चतुर्षेताम्बुदोजानां सामयादह री यथा ॥  
सुशृत-स'हिता, शारीरस्थानम्, ३।

278. आङ्गाराचारचे दामिर्याहशेभिः समन्वितौ ।  
स्त्रीपुंसी समुपेयाता तयोः पुरोडापि ताहवः ॥ ४६  
सुशृत-स'हिता, शारीरस्थानम्, ४६।

takes only beneficial food, and leads a pure (hygienic) life, he and his descendants do not suffer from insanity." *Charaka VI. 9. 63*<sup>279</sup>.

"If a man copulates with a menstruating woman on the first day of her course, he shortens his life, and there is embryonic abortion of the fruit of conception ; if on the second day, there is still-birth ; if on the third day, the child is of incomplete development and becomes short-lived ; but if on the fourth day, the child is well-developed and possesses good vitality (a long life). As a thing (floating substance) thrown in a river can not ascend up-stream against the course of the current, so when the menstrual blood flows, the seed (spermatozoon) can not enter in and become active (during the copulative act, the forward and the backward movement, especially of the glans-penis, acts almost like a valve of the suction-pump, creating a kind of vacuum state, widening the mouth of the womb, deflating it and drawing it forward, so that when the semen is discharged, it shoots like a jet of spray and is sucked by the womb with

279. निःसामिषमयो यो हिताद्य प्रयतः शुचिः ।

निजावानुभिष्टादैः सख्यान् न स यज्ञते ॥

चरक-स'हिता, चिकित्साप्रकाशन, ८।

the ovum ; in case the vagina is filled with menstrual blood or fluid, this suction can not but be incomplete ; the vaginal secretions at the entrance of the penis or in strong sexual desire serve simply to lubricate the passage, so that the delicate mucous membrane can not be hurt ). Therefore one should not indulge in the sexual union during the first three days of menstruation, nor (after twelve days) in the month (in the second week the ovum begins to degenerate, and either it is incapable of fertilization, or if fecundated, it is apt to reproduce a weakling )." *Susruta III. 2. 31<sup>100</sup>.*

*Sex-determination of the offspring :* "If a male child is desired, the husband should practise continence for a month (to increase sexual erethism and vigor), and after fattening himself with clarified butter, milk-fat, milk and rice, shall copulate with his wife after music, endearments (to excite the senses) and assurance of

280. तत् प्रथमि दिवसि क्षतुमर्या नैषुगमनमनायुषं पुंसा भवति । यस तत्त्वावौयते गर्भः, स प्रसवमानो विमुचते । वितीयेऽप्येषं सूतिकाशहि वा । वितीयेऽप्येषं सर्वपूर्णाहोऽल्पायुर्वा भवति । चतुर्थे तु सर्वपूर्णाहो दौर्धायुव भवति । न च प्रवर्त्तमाने इत्ये वीजं प्रविष्टं गुणकरं भवति, यथा नदा प्रतिक्षेपः इति इत्यं प्रचिह्नं प्रतिनिवर्तते जोर्हं गच्छति तददेव द्रष्टव्यम् । तत्त्वान्वियनवर्ती विराब्धं परिवृत्तं चतः यरं मासादुपेयात् ॥ १ ॥ सुश्रत-संहिता, शारीरस्तानम्, ३ ।

love to her, on the fourth, sixth, eighth, tenth or twelfth day of menstruation, and she likewise should have lived a continent life for a month, fattened herself with clarified butter and fed on oily and nitrogenous foods.

If the conjugal duty is performed on these days, it conduces to ( the promotion of ) wisdom, longevity, health, increase of population, wealth and strength.

If a girl is desired , sexual union should take place on the fifth, seventh, ninth or eleventh day. From the thirteenth day ( up to the new monthly cycle ; from the second week after menstruation, the ovum begins to deteriorate and is usually incapable of impregnation ) cohabitation is blameworthy ( as the union is fruitless, it is only for the sensual gratification and indulgence, and not for the welfare of the race)".

*Susruta III. 2. 28-30<sup>281</sup>.*

281. ततोऽपराह्ने पुमान् मासं व्रद्धचारी सविंश्चिंथः सप्तिःस्त्रीराम्भा शाश्वोदनं भुजा मासं व्रद्धचारिणीं तैलशिखां तैलमापोत्तराहारां नारीसुपेयाद्वावी सामादिभिरभिविद्वास्य विकल्पयेद्वा चतुर्थां षष्ठ्यां दशम्यां बादश्वादोपेयादिति प्रवकामः ॥ २८

एष तरोत्तरं विद्यादायुरादीगमेव च ।

प्रजासीभाग्यमेवर्यं वलञ्ज दिवसेषु वै ॥ २८

अतः परं पञ्चम्यां सप्तम्यां नवम्यामिकादश्वाच लीकामः । त्रूपोदशीप्रभृतवौ विद्याः ॥ २९

सुश्रूत-स'हिता, शारीरस्त्रानम्, १।

Sex-determination is still speculative. It was believed a few years ago that there were two kinds of ovum, male and female, the former produced by the right ovary and the latter by the left. By animal experimentation and human ovariectomy, it has been found to be erroneous. The egg produced by the ovary is still bi-sexual, hermaphroditic in nature, and its sex is not determined like all its mono-cellular prototypes, before it phylogenetically ascends the scale of evolution, that is before amphimixis is started through the process of fertilization by the male reproductive cell. That is the starting point of sexual differentiation which begins with the impregnation of the ovum. The question then arises whether the sex-determinant resides in the spermatozoon or in the ovum. In the Hymenoptera an accessory chromosome has been found in nearly half the spermatozoa, and it was regarded by McClung as the sex-determining factor. It may be simply an '*idant*'—bearer of arrested hereditary trait. But the experiments of Loeb have demonstrated that the spermatozoon, at least in the lower scale of evolution, only acts as a stimulant to start the amphimixis, and it can be substituted by artificial chemical stimulus. And in the aphids, parthenogenetic generations









